Vision and Action Plan

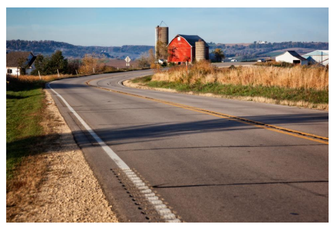
Vision

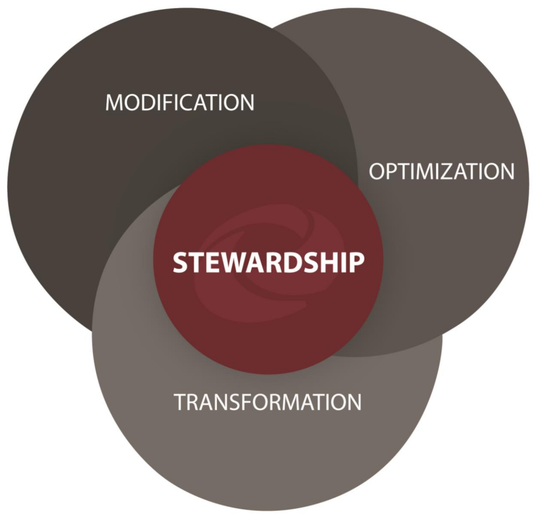
The vision of the Iowa DOT and Transportation Commission is:

A safe and efficient multimodal transportation system that enables the social and economic wellbeing of all Iowans, provides enhanced access and mobility for people and freight, and accommodates the unique needs of urban and rural areas in an environmentally conscious manner.

To help translate this vision into meaningful actions, an overall plan framework has been set up with the following components.

- A broad **vision statement** that encapsulates the overall vision for Iowa's future transportation system.
- Overarching **investment areas** within which actions will be defined to implement the system vision.
- A fiscally responsible **action plan** that defines how the vision will be implemented, through two broad categories.
  - Specific **strategies** that will be utilized by the department that fit within one or more of the investment areas.
  - Where appropriate, specific **improvement needs** the department feels are necessary to help achieve the overall system vision.





Investment Areas

Four principal investment areas were identified to help achieve the system vision. Each of these investment areas are supported by specific strategies and improvement types.

- **Stewardship** through maintaining a state of good repair
- **Modification** through rightsizing the system
- **Optimization** through improving operational efficiency and resiliency
- **Transformation** through increasing mobility and travel choices

Stewardship – maintaining a state of good repair

Maintaining a state of good repair involves applying appropriate asset management techniques to keep transportation infrastructure in adequate condition. Maintaining the system also involves operational maintenance, such as plowing snow, and making needed investments to address specific issues.

Modification – rightsizing the system

Rightsizing the system and the service it provides means ensuring that the decisions we make today regarding transportation investments are done with the future in mind, and that we implement a system that will meet the needs of the 21st century. This will require significant investment in stewardship, some focused capacity expansion as resources allow, and perhaps even some contraction of the system.

Optimization – improving operational efficiency and resiliency

It is important to work continually to improve the system and how it is utilized by passenger and freight traffic. The answers to decreasing commute times, routing freight more efficiently, or improving system reliability may lie in optimizing the existing system rather than in additional pavement.

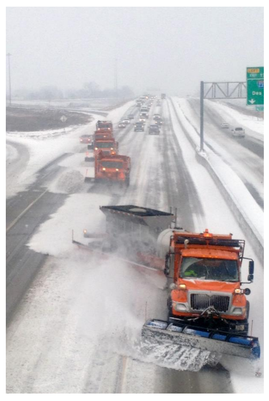
Transformation – increasing mobility and travel choices

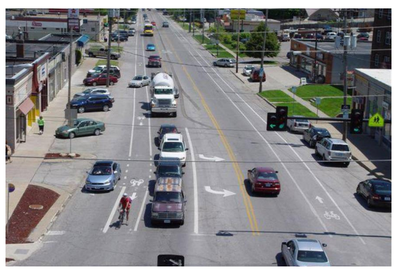
In order to provide a multimodal transportation system that accommodates all aspects of Iowa's population and development patterns, it is important to have a diverse menu of travel choices enabling mobility across different demographics and land uses. This can involve investments beyond the typical highway system that target moving people by other modes of transportation.

Vision → **Investment Areas** → **Strategies/Improvement Needs**

Action Plan

The action plan includes a needs analysis for each mode, a matrix of highway improvements for the entire Primary Highway System, and 80 strategies that have been identified to help the Iowa DOT maintain, modify, optimize, and transform the transportation system. Each modal board includes the needs analysis and strategies that were identified for that particular mode. Several additional categories of strategies were also included in the plan, and are included here.





Strategies

Iowa DOT strategies will include the following. The graphics show which of the four investment areas (stewardship, modification, optimization, and transformation) the strategies relate to.

Asset management

- Continue to advance targeted capacity improvement projects on key Interstate Highway System corridors.
- Develop an asset management governance structure to improve the effectiveness and transparency of the project selection process.
- Improve the efficiency and accuracy of data collection and access to enhance data available for decision-making.
- Adequately communicate the benefits of asset management to ensure the Iowa DOT's program is sufficiently funded and properly implemented.
- Monitor continued population shift toward the state's urban areas and associated implications for the level of funding available for statewide asset management activities.
- Ensure asset management and other program delivery functions can be properly implemented regardless of staffing constraints.

Energy

- Optimize the propane supply chain to better predict and proactively respond to propane shortages.
- Support the expanded use of alternative fuel vehicles in Iowa.
- Support the safe rail transport of crude oil and biofuels.
- Explore incentives for alternative vehicle fueling infrastructure.
- Optimize the passenger transportation system to provide more opportunities and improve mobility.

Freight

- Target investment on the interstate system at a level that reflects the importance of this system for moving people and freight.
- Leverage and disseminate real-time information on system conditions to support improved mobility.
- Optimize the freight transportation network to minimize cost and travel time, improve supply chain efficiency, and reduce energy use.
- Advance a 21st century Farm-to-Market System that moves products seamlessly across road, rail, and water to global marketplaces.
- Streamline and align freight-related regulations and minimize unintended consequences.
- Provide measured, clear, nontechnical performance results for the transportation system.

Safety

- Support evidence-based decision-making and the installation of engineering countermeasures.
- Implement appropriate and cost-effective engineering solutions at intersections.
- Inform and support legislation that enhances transportation safety.
- Sustain the multimedia Zero Fatalities program and identify new partners in each of the five safety emphasis areas.
- Support the enhancement of driver education programs and increase public outreach and education regarding unsafe driver behaviors.
- Support additional officer hours on roadways and encourage special enforcement campaigns.
- Support expanded law enforcement training to effectively identify impaired drivers.
- Facilitate access to and track usage of traffic safety records data.
- Support equipping law enforcement with state-of-the-art technology.

Technology

- Plan for the transition to and implementation of connected and automated vehicle technology.
- Incorporate pause points into the project development and programming processes to consider the evolving impacts of disruptive technologies.

Transportation systems management and operations (TSMO)

- Reduce the number of overall major crashes and the number of secondary crashes.
- Maximize the use of existing roadway capacity.
- Increase the resilience of the transportation system to floods, winter weather, and other extreme weather events.
- Implement critical emergency transportation operations (ETO) strategies as identified in the ETO Plan.
- Work with special event generators to actively manage traffic during large scale events that impact the highway network.
- Use integration and big data mining strategies to improve decision making and performance management.
- Coordinate responses to large scale traffic incidents with adjacent states.

Trends

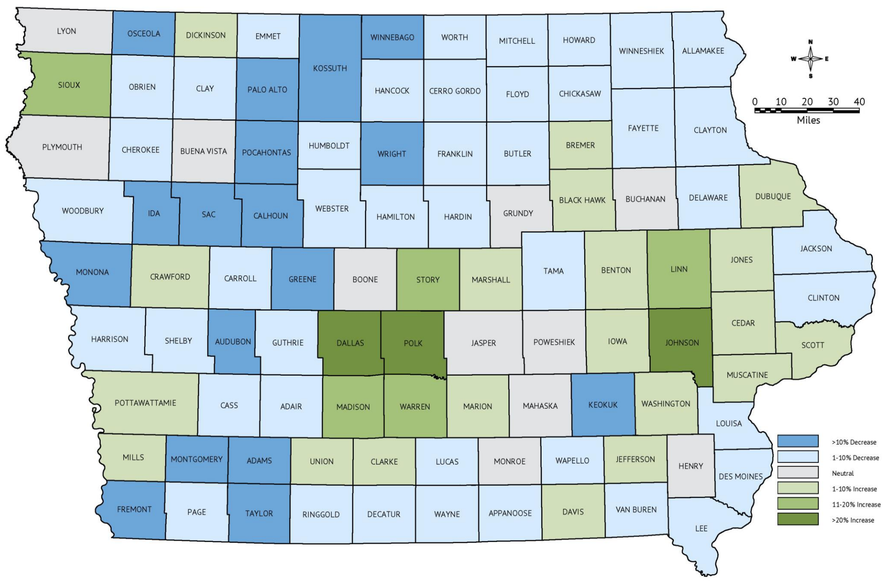
Demographic trends

- Iowa's population is growing at a slow pace
- Iowa's population growth is not uniform throughout the state
- Iowa's population is urbanizing
- Iowa's population is undergoing generational shifts
- Iowa's minority population continues to grow

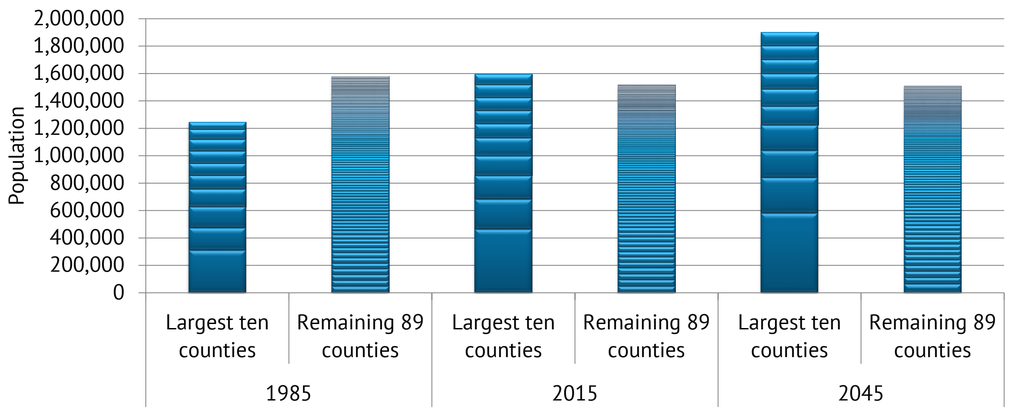
Implications for transportation

- Increased population in and around metropolitan areas may create congestion and capacity issues.
- Local jurisdictions with decreasing population will experience additional strain on already tight road budgets.
- Improving the roadway and driving environment and expanding transportation options are necessary to help meet the mobility needs of older residents.
- Transportation planning will need to account for varied work and life preferences across generations and consider how future generations will live, work, and travel.
- It is important that all Iowans, including minority, low-income, and disabled populations, have access to employment and services in both metropolitan and nonmetropolitan areas.

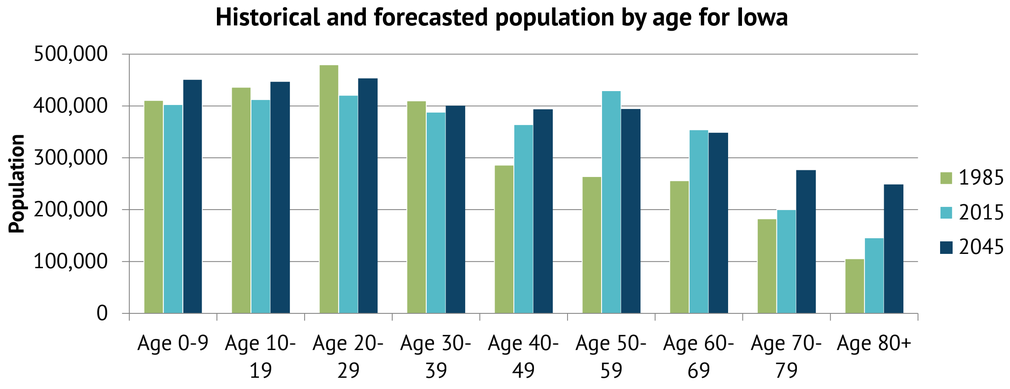
County population change, 2000-2015



Comparison of Iowa's estimated county populations, 1985, 2015, 2045



Historical and forecasted population by age for Iowa



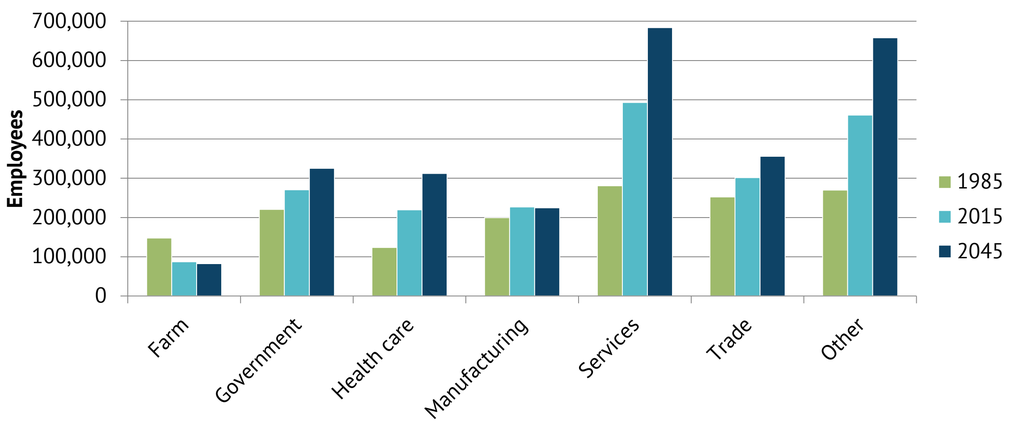
Economic trends

- Total employment in Iowa is expected to increase slowly
- Iowa's traditional employment sectors have changed
- Per capita personal income and median household income are increasing but remain below the national average
- Iowa's gross domestic product is increasing

Implications for transportation

- Maintaining an accessible, reliable, and well-connected transportation system is an important factor in attracting and retaining employers.
- There will be changing demands on urban and rural transportation infrastructure to accommodate growing employment sectors.
- While the number of jobs tends to be increasing the most in service sectors, agriculture and other freight-intensive industries are experiencing large amounts of growth in terms of GDP. Both trends have significant implications regarding commuting patterns and freight transportation.

Iowa employment, 1985-2045



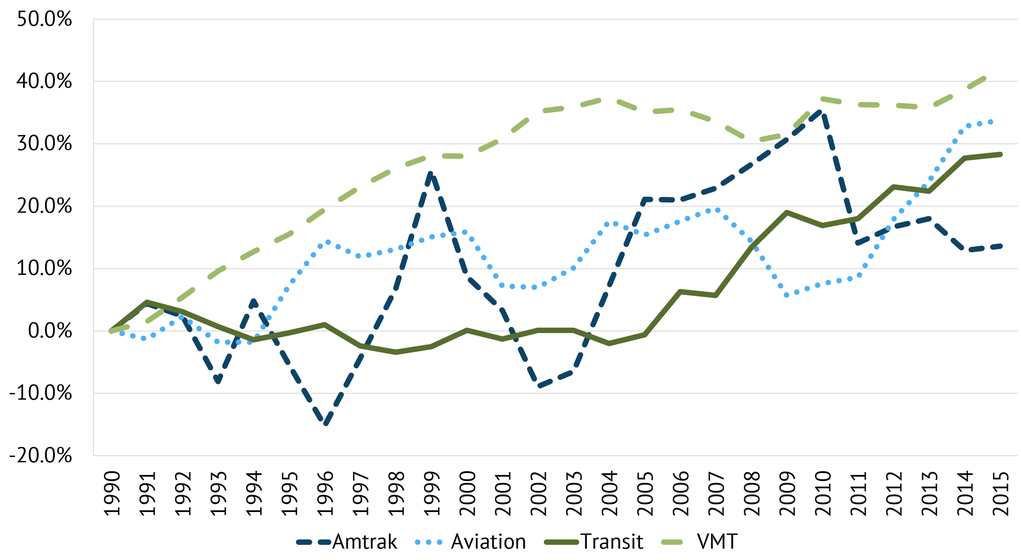
Passenger trends

- Iowans are traveling more, but passenger travel is not uniform across all modes of transportation
- The number of vehicles per household has increased
- The number of registered vehicles outnumbers licensed drivers
- Most Iowans drive to work alone
- Average travel time to work has increased, but Iowans still have one of the lowest average commute times nationally

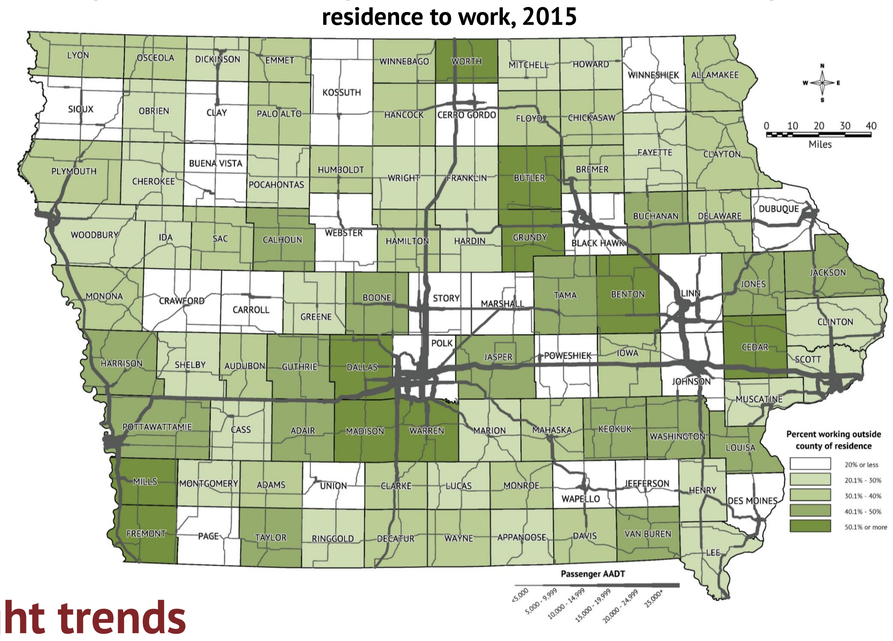
Implications for transportation

- Travel across all passenger modes has increased nearly 43 percent since 1990, while Iowa's population has only grown by 12 percent. Investments in all passenger modes are necessary to ensure mobility options for Iowans.
- If population and vehicle ownership trends continue, there will be more travel on Iowa's roadway system.
- Driving to work alone is by far the most common mode choice for commuters, and its percentage share has increased over time. However, bicycling to work is becoming a more popular choice and saw the largest relative increase in users between 1990 and 2015.
- With more Iowans driving farther to work, it will be increasingly important to identify and maintain commuter routes and provide associated services.

Iowa passenger travel trends by mode, 1990-2015



Passenger traffic on primary highways and percent of workforce leaving county of residence to work, 2015



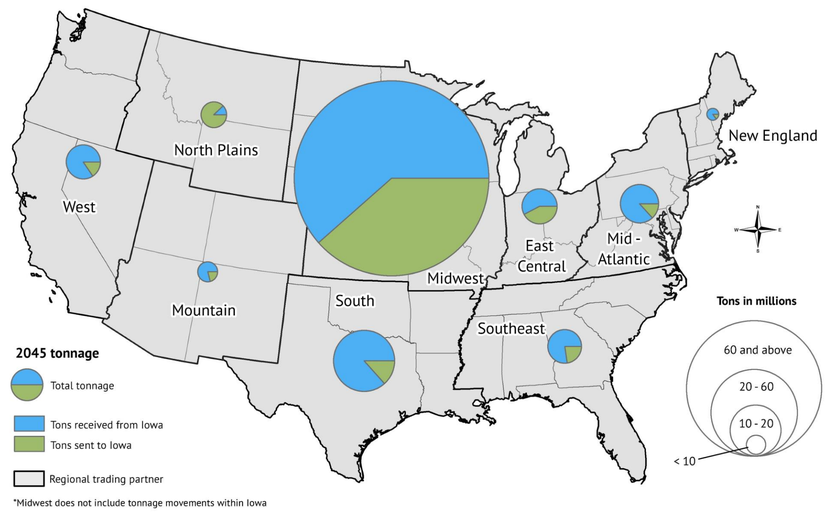
Freight trends

- Freight costs and efficiencies will continue to vary across modes
- Iowa's freight is expected to steadily increase through 2045
- Iowa's freight growth will not be uniform across modes
- The majority of Iowa's freight will continue to be moved by truck
- Increasing amounts of freight will move through Iowa via rail main lines
- Iowa exports to other states and other countries will continue to increase

Implications for transportation

- Globalization and growth in both national and international trade are placing more demands on our freight system.
- With value-added production and overall economic activity increasing in Iowa, freight movements will increase.
- The growing demand for freight increases concerns about its safety, energy consumption, and environmental impacts.
- With freight projected to increase, the effects of congestion on freight mobility, reliability, and costs will need to be taken into consideration.
- Reducing delays, maintaining infrastructure, and optimizing the state's freight system are key priorities.
- With weight limitations on trucks being relaxed in recent years, the impacts to infrastructure and operations need to be taken into consideration.

Regional trading partners and projected freight tonnage movements in 2045



Sources: Iowa Department of Transportation; U.S. Census Bureau, American Community Survey Five-Year Estimates; Woods and Poole Economics Inc., Federal Highway Administration's Freight Analysis Framework

Aviation

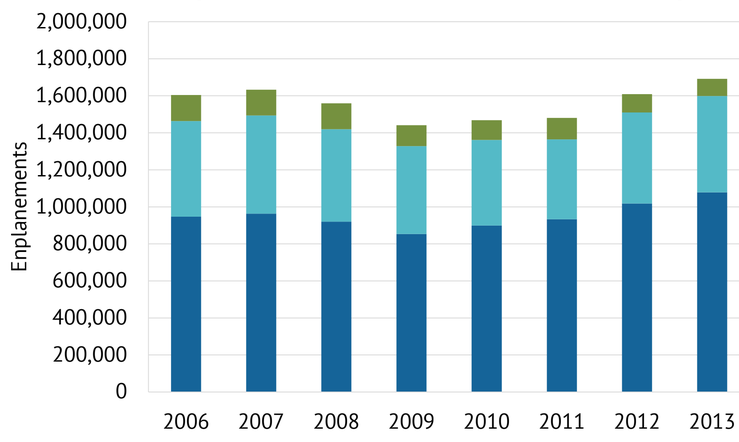
Highlights

- The 108 publicly owned airports in Iowa serve a variety of needs and functions, including business and leisure travel, medical transport, law enforcement, agriculture applications, freight transport, education, and recreation.
- There are more than 3,700 aircraft and 5,500 pilots in the state.
- More than 1 million aircraft operations occur annually in the state.
- Four commercial airports and two general aviation airports in Iowa have on-site military units.
- More than 1.8 million people are boarded (enplanements) on commercial aircraft and nearly 98,000 tons of cargo are shipped from Iowa's eight commercial service airports each year.
- An estimated 86 percent of the publicly owned general aviation airports in Iowa support aerial applicator activity for agriculture, treating an area equal to the size of Connecticut each year.
- An estimated 71 percent of Iowa's population lives within 30 minutes of a commercial or enhanced service airport.
- An estimated 79 percent of Iowa's employers are located within 30 minutes of a commercial or enhanced service airport.

Key issues

- Approach obstruction mitigation is needed to improve the percent of primary runways with clear approaches.
- Height zoning is needed to encourage compatible land use around airports.
- Continuation of aviation weather observing stations maintenance and operation is needed for pilot safety and weather information dissemination.
- Strategic planning is needed for airport sponsors to incorporate business and local concerns in airport planning.
- Increased funding is needed to improve the percent of airports meeting recommended facility targets.
- Recommended service targets should be met to provide services adequate to meet user needs.
- Air service changes should be monitored to identify potential impacts to communities in Iowa.
- Continued safety initiatives are needed, including wildlife mitigation, pilot safety programs, pavement marking, and maintenance.

Enplanements at Iowa's commercial service airports



Aviation needs

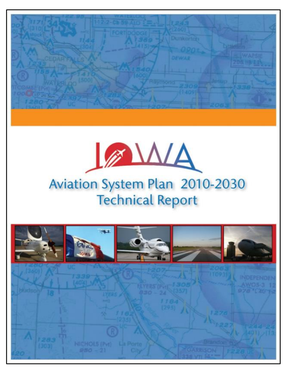
Needs for the aviation system in Iowa are outlined in the 2010-2030 Iowa Aviation System Plan, which provides a detailed overview of the Iowa aviation system. It evaluates existing conditions and makes recommendations for future development of the air transportation system to meet the needs of users.

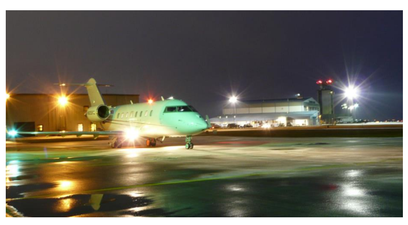
As outlined in the plan, facility and service targets have been established for each airport role. The graphs below show the percentage of airports meeting facility and service targets by airport role.

Facility targets focus on the physical infrastructure of the airport. Facility target categories include primary runway length, primary runway width, runway lighting, taxiway lighting, covered aircraft storage, and terminal parking.

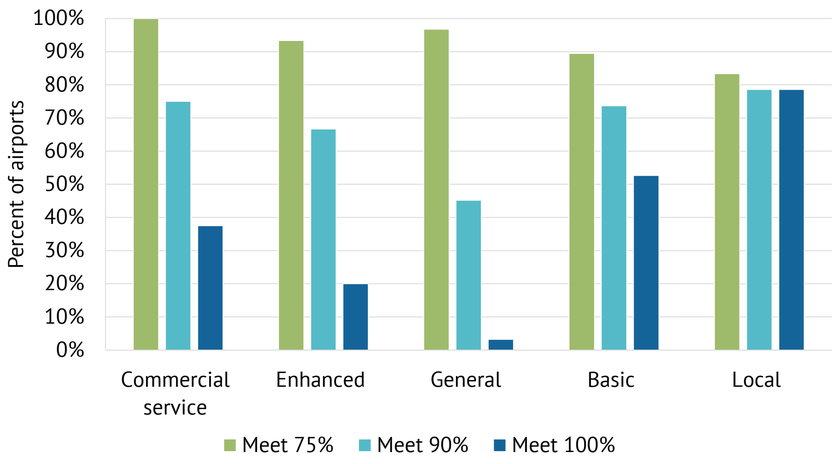
Service targets reflect the types of services necessary to meet typical user needs. Service target categories include fuel type and hours of availability; weather reporting; airport staffing; flight training; aircraft maintenance; availability of ground transportation; snow removal; and features available to airport users, such as concessions, restrooms, and internet.

While not all airports are meeting 100 percent of targets, this does not equate to the airports being substandard. In some cases, long-range projects may be underway to address targets, and some targets involve factors beyond the control of the airports.

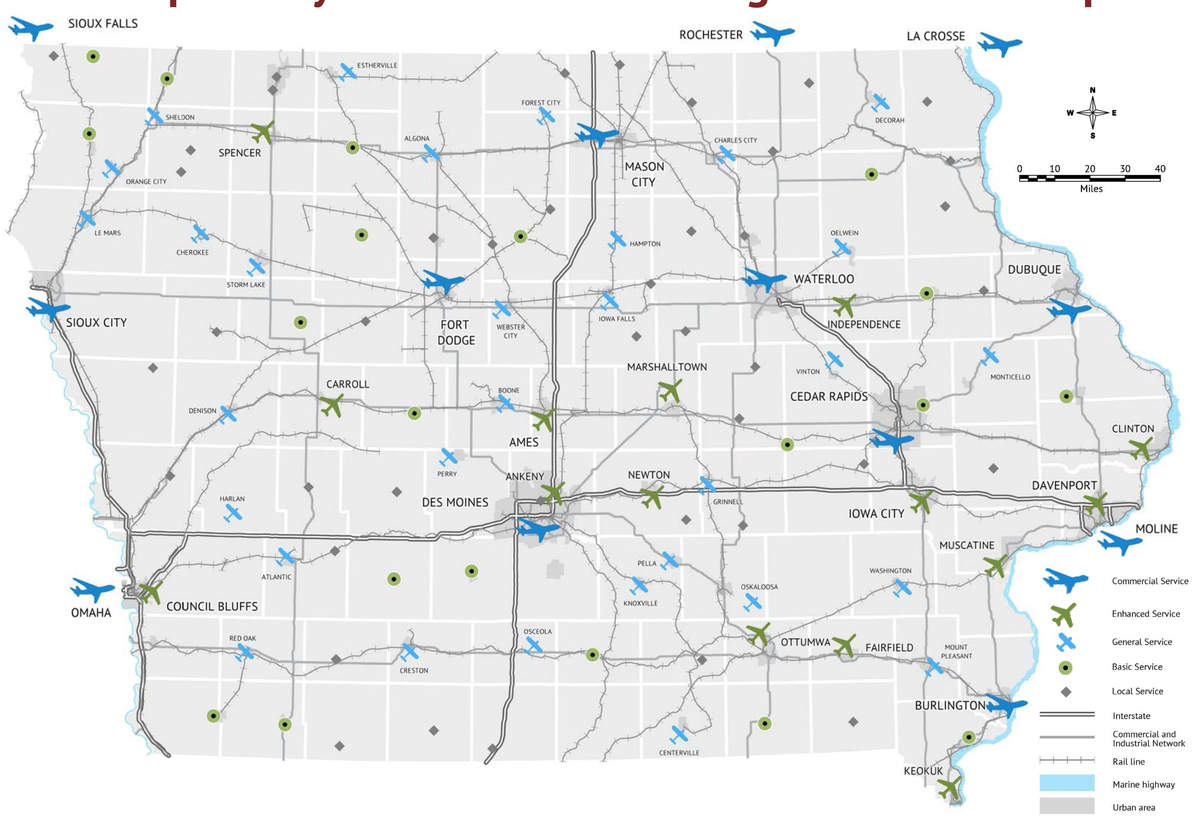




Percent of facility targets met by airport type



Iowa airports by role and surrounding commercial airports



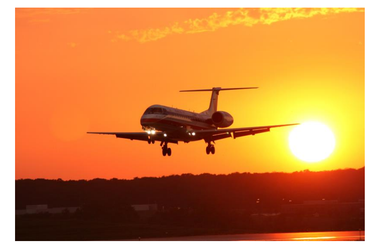
Commercial service – 8 airports
Regularly scheduled commercial airline service; support a full range of general aviation activity.

Enhanced service – 15 airports
Paved runway 5,000 feet or longer; support most general aviation aircraft and business jets.

General service – 31 airports
Paved runway 4,000 feet or longer; support some general aviation aircraft and business jets.

Basic service – 19 airports
Paved runway 3,000 feet or longer; support smaller aircraft.

Local service – 42 airports
Runways less than 3,000 feet; little or no airport services.

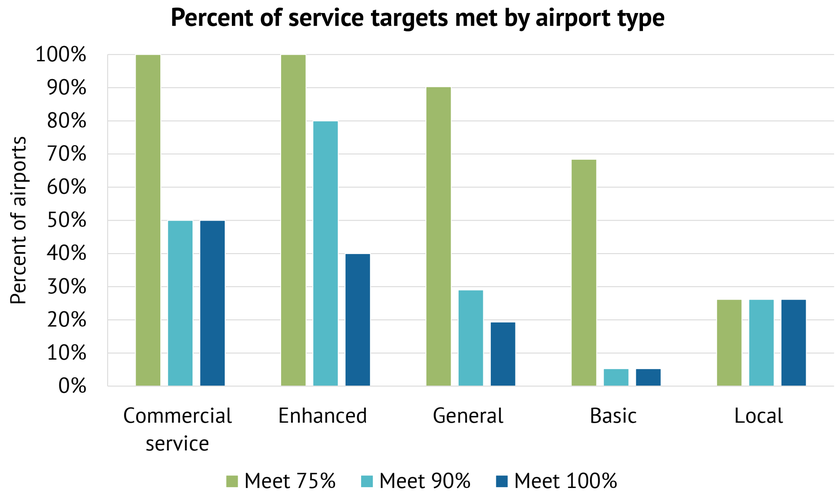


Strategies

Iowa DOT strategies for the aviation system will include the following. The graphics show which of the four investment areas (stewardship, modification, optimization, and transformation) the strategies relate to.

- Maintain and enhance the statewide network of aviation weather observing systems.
- Evaluate implementation of new and emerging aviation technologies.
- Maintain adequate accessibility to airports with an appropriate range of services.
- Promote the implementation of compatible land-use guidelines near airports.
- Improve runway approaches through obstruction removal and mitigation funding.
- Encourage airport planning.
- Maintain and enhance aviation vertical infrastructure needs.
- Promote and assist in active wildlife management at airports.
- Maintain and enhance airside facilities.

Percent of service targets met by airport type



Sources: Iowa Department of Transportation; Federal Aviation Administration

Bicycle and Pedestrian

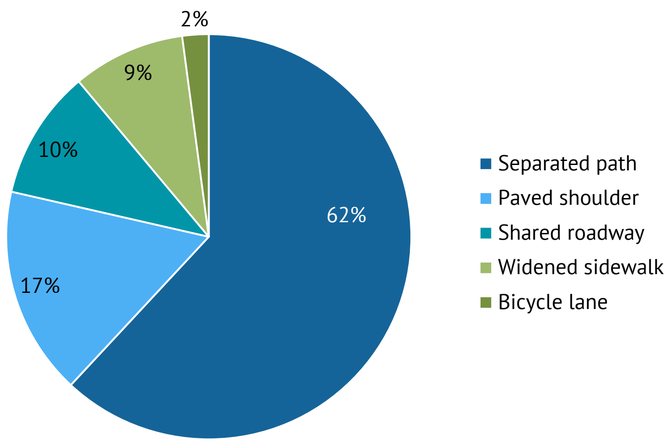
Highlights

- Iowa has more than 3,000 miles of trails, paved shoulders, and other bicycle and pedestrian facilities.
- It is estimated that 4 percent of Iowans walk or bike to work.
- Integration of pedestrian, bicycle, and transit needs with vehicular movements is improving.
- Trail use is increasing.
- Bicycle helmet use is rising.
- Businesses have identified local trails as an aid in recruitment.
- Demand for urban sidewalks has increased.
- Rising public attention for healthy lifestyles has caused an increase in bicycling and walking, including children traveling to and from schools.

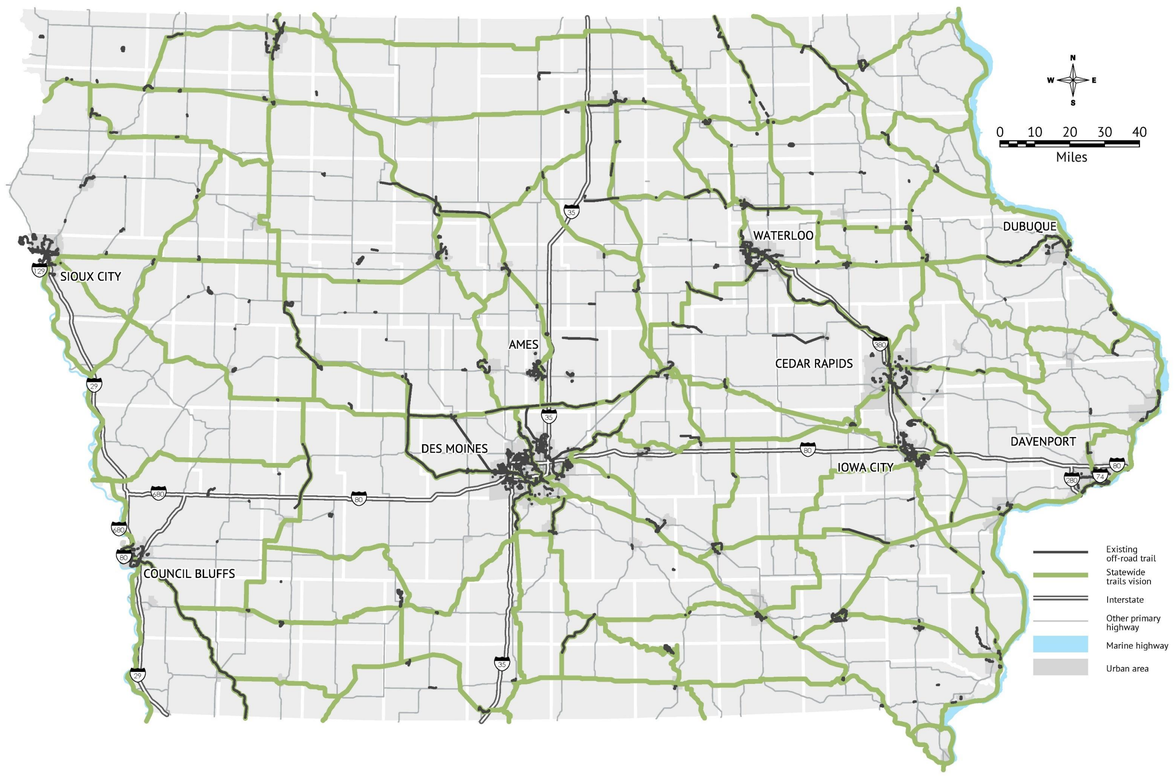
Key issues

- Additional funding is needed for system expansion and maintenance.
- Many communities are not bicycle- and pedestrian-friendly, which could be partially addressed through the expansion of complete streets policies at the local and state level.
- Infrastructure improvements are needed to address deficiencies and ongoing maintenance problems.
- Bicycle and pedestrian fatalities and injuries are too prevalent.
- Improved coordination and cooperation is needed to better connect Iowa's trail systems.
- Additional education is needed, including safety programs for bicyclists and pedestrians and training on the health benefits of bicycling and walking.
- Legislative issues continue to be debated, such as safe passing laws.

Iowa bicycle and pedestrian facilities by type



Iowa statewide trails vision



The prior statewide transportation plan separated multiuse trails into three functional classifications: Level 1 – five trails of statewide significance; Level 2 – trails of regional significance; and Level 3 – trails of local significance.

The emphasis on the five Level 1 trails introduced over the last decade was intended to focus the Iowa DOT's resources and funding mechanisms to create a backbone system for the statewide trail network. However, in some cases this focus may have prioritized trail corridors that are not yet in high demand by Iowans. Trails in Iowa are typically built by expanding existing networks and seizing opportunities as they arise.

Therefore, with this Plan, the vision for Iowa's statewide trail system is a renewed emphasis on a statewide network of separated multiuse trails connecting rural communities, metropolitan areas, state and county parks, and natural amenities. The prioritization of projects will be based on the trail's ability to improve access and connectivity rather than on its functional classification. The Level 1-3 classification scheme will no longer be emphasized. This vision for the statewide trail system will compliment an overall approach to bicycle and pedestrian facilities that includes on-road accommodations.

Bicycle and pedestrian needs

The Iowa DOT has been updating its bicycle and pedestrian plan, and anticipates completing the plan following the completion of Iowa in Motion 2045. As part of that plan development, an initial needs assessment has been conducted for the entire Primary Highway System, excluding interstates.

Segment ratings of good, moderate, or poor for bicycling were determined based on factors such as total annual average daily traffic (AADT), speed limit, percent truck traffic, total pavement width, and percent where passing is not allowed. In general, additional separation is recommended for bicyclists as traffic volumes and speeds increase.

The charts below show the methodology for rural and urban bicycle compatibility ratings, and the map shows segment-level compatibility ratings of the Primary Highway System.

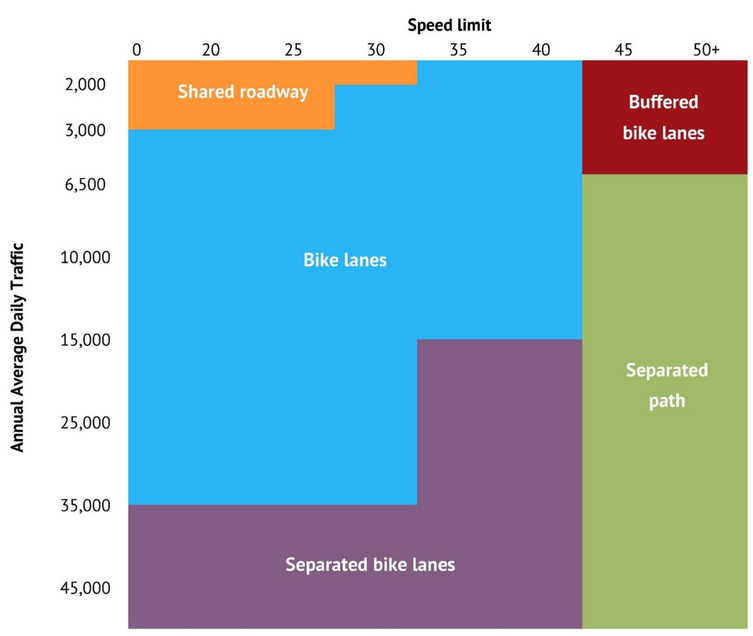
Generalized rural roadway conditions and bikeway treatment recommendations

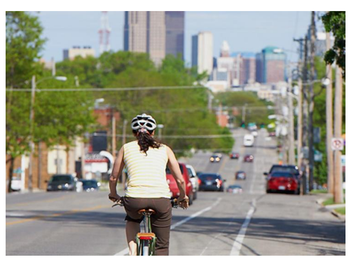
Annual Average Daily Traffic	Existing paved roadway width: ⩽22'	23' - 24'	25' - 28'	29' - 30' (may include 4' paved shoulders)	⩾31' (may include 5-6' paved shoulders)	Any width (with adjacent path)
Less than 1,000	Suitable as is	Suitable as is	Suitable as is	Suitable as is	Suitable as is	Suitable as is
1,000 to 1,500	3' paved shoulder on higher use corridors	3' paved shoulder on higher use corridors	3' paved shoulder (add or widen existing) on higher use corridors	Suitable as is	Suitable as is	Suitable as is
1,500 to 2,000	3' paved shoulder	3' paved shoulder	3' paved shoulder (add or widen existing	Suitable as is	Suitable as is	Suitable as is
2,000 to 3,000	4' paved shoulder	4' paved shoulder	4' paved shoulder (add or widen existing)	4' paved shoulder (widen existing)	Suitable as is	Suitable as is
3,000 to 5,000	4' paved shoulder	4' paved shoulder	4' paved shoulder (add or widen existing)	4' paved shoulder (widen existing)	4' paved shoulder (widen existing)	Suitable as is
5,000 to 6,500	6' paved shoulder	6' paved shoulder	6' paved shoulder (add or widen existing)	6' paved shoulder (widen existing)	6' paved shoulder (widen existing)	Suitable as is
Over 6,500	10' paved shoulder	10' paved shoulder	10' paved shoulder (add or widen existing) or separate path	10' paved shoulder (add or widen existing) or separate path	10' paved shoulder (add or widen existing) or separate path	Suitable as is

Good Moderate Poor

Note: All recommended paved shoulder widths are exclusive of rumble strips.

Generalized urban roadway conditions and bikeway treatment recommendations



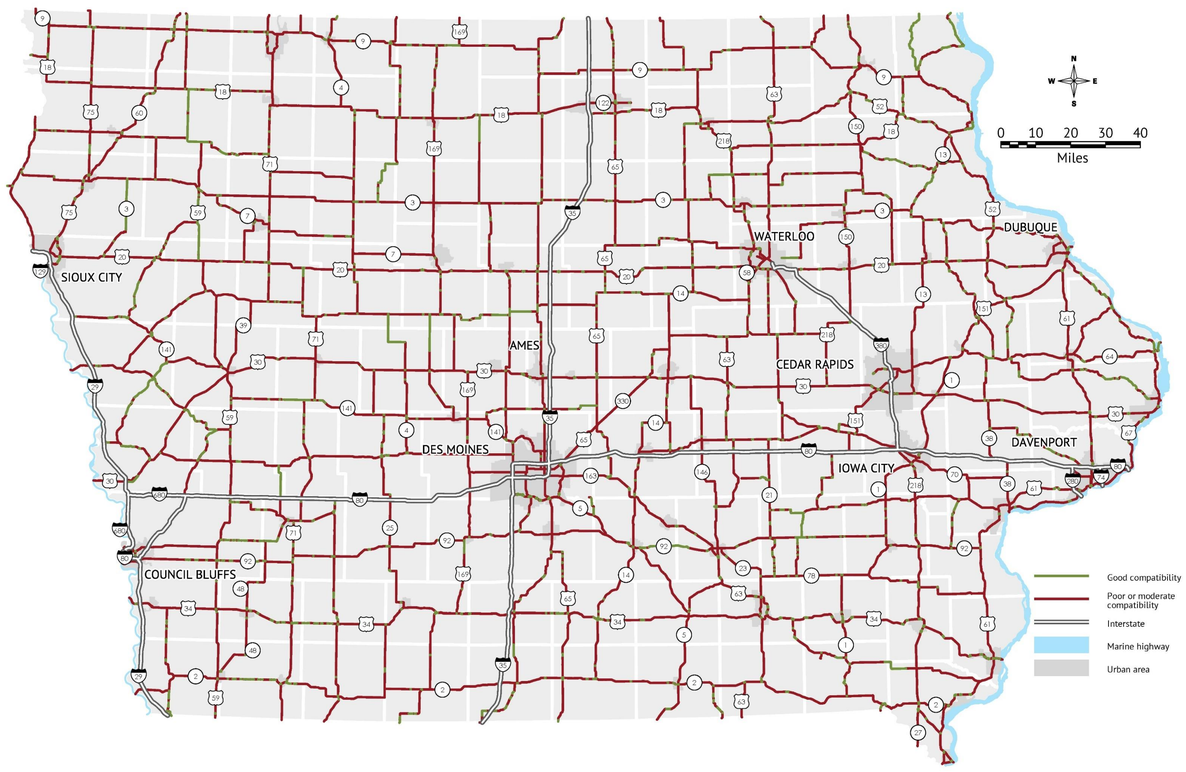


Strategies

Iowa DOT strategies for the bicycle and pedestrian system will include the following. The graphics show which of the four investment areas (stewardship, modification, optimization, and transformation) the strategies relate to.

- Evaluate key safety challenges pertaining to bicycling and walking and develop crash reduction strategies.
- Adopt and implement a complete streets policy that applies to all Iowa DOT projects.
- Consider same-source funding to build bicycle and pedestrian accommodations as part of road projects.
- Complete a comprehensive bicycle and pedestrian plan for the state.
- Increase the quality and consistency of the design of bicycle and pedestrian accommodations across the state.

Bicycle compatibility rating of the Primary Highway System



Sources: Iowa Department of Transportation; Toole Design Group

Public Transit

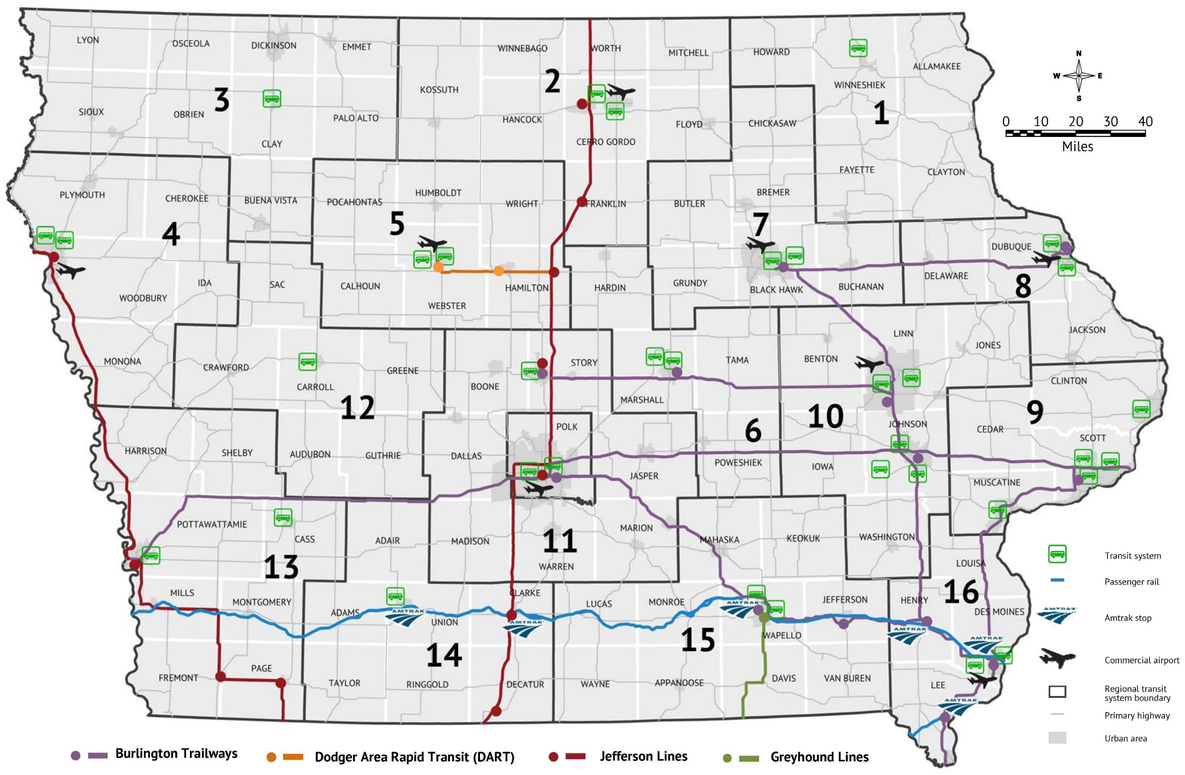
Highlights

- Serves all Iowa counties and cities.
- Vital to the quality of life for all citizens by providing access to community services, as well as making communities stronger and more vibrant.
- Provides more than 24.2 million rides annually from large urban systems, 3.2 million rides from regional systems, and 1.4 million rides from small urban systems.
- Provides access to work, school, medical, retail, and community resources that utilize connections between modes.
- Allows individuals to maintain independence.
- Provides commuters and others with choice of transportation.

Key issues

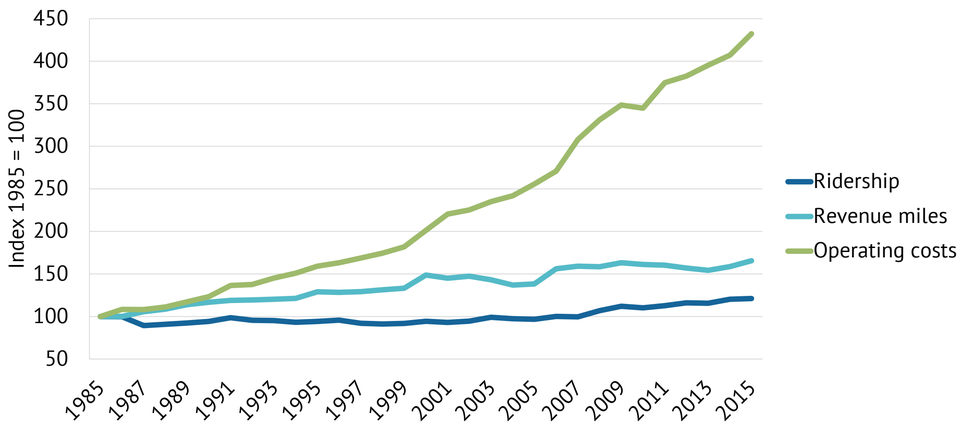
- Additional operational and capital funding is needed.
- Older buses require more maintenance and repairs.
- Transit ridership cost per trip is increasing.
- Seamless transfers are needed between the 35 transit systems and intercity bus service.
- Expanded transit services, including additional hours and weekend service, are needed.
- More coordination is needed between transit systems, human service organizations, and school districts.
- Indoor bus parking facilities are needed.
- The public is generally reluctant to use transit services.

Iowa public transit systems and other passenger services



- 35 public transit systems in Iowa
  - 12 large urban systems – account for 84 percent of total transit ridership
  - 7 small urban systems – located in communities between 20,000 and 50,000 people
  - 16 regional systems – support all 99 counties
- 4 intercity transportation bus services.
- Additional passenger services – vanpools, carpools, bus charter companies, transportation network companies, taxis, Amtrak, and commercial air service

Trend in public transit operations index (1985 = 100)



Strategies

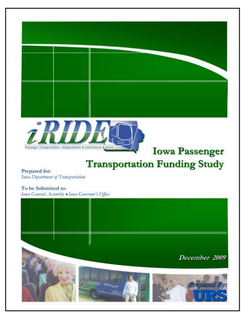
Iowa DOT strategies for the public transit system will include the following. The graphics show which of the four investment areas (stewardship, modification, optimization, and transformation) the strategies relate to.

- Replace aging public transit vehicles.
- Pursue new funding opportunities for public transit.
- Improve efficiency, effectiveness, and quality of public transit service.
- Improve interagency coordination between public transit agencies and human service providers.
- Identify new public transit service and expansion opportunities.
- Improve the safety and security of the public transit system.
- Support affordable passenger transit service.
- Continue to implement the Iowa Park and Ride System Plan through examination of the associated statewide candidate locations.
- Improve intercity bus service.
- Increase awareness of public transit through marketing and education.
- Improve public transit infrastructure.

Public transit needs

Needs for the public transit system in Iowa are expected to grow substantially between now and 2045, and are reflected in the charts below.

Service needs are based on what will be required to provide the level of public transit service needed in the state, and are based on analysis in the 2009 Iowa Passenger Transportation Funding Study. To meet baseline demand, ridership across the state's transit systems would need to increase by 54 percent, or an additional 38,000 trips per day.



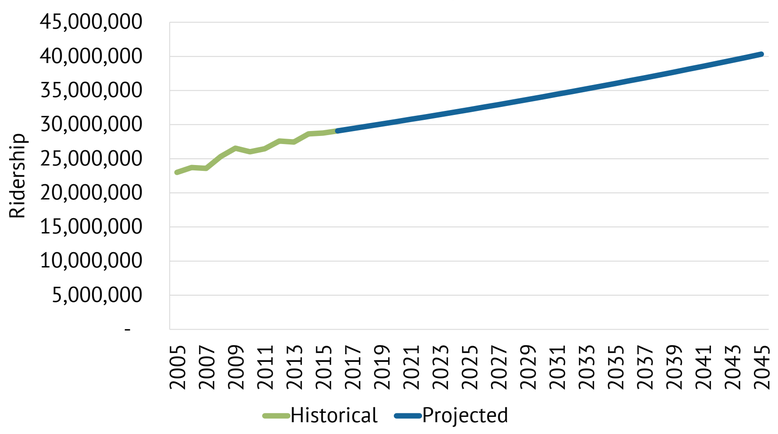
Despite the gap in meeting baseline demand, ridership among the state's regional, small urban, and rural systems has grown steadily and is anticipated to continue to grow. Ridership projections show growth from 28,768,539 trips in 2015 to 40,325,122 trips in 2045, an increase of 40 percent.

Fleet needs are based on the age and condition of public transit vehicles. In Iowa, 63 percent of all public transit revenue vehicles in the state currently exceed their useful life thresholds. If funding stays static, this number would quickly grow to 80 percent by 2030, and will be approaching 90 percent by 2045.

Facility needs include administrative space, vehicle storage buildings, and vehicle maintenance garages. Agencies were surveyed in fall 2016 and asked about needs for additional square footage in these categories by 2045, with the largest need foreseen in vehicle storage for regional transit systems.

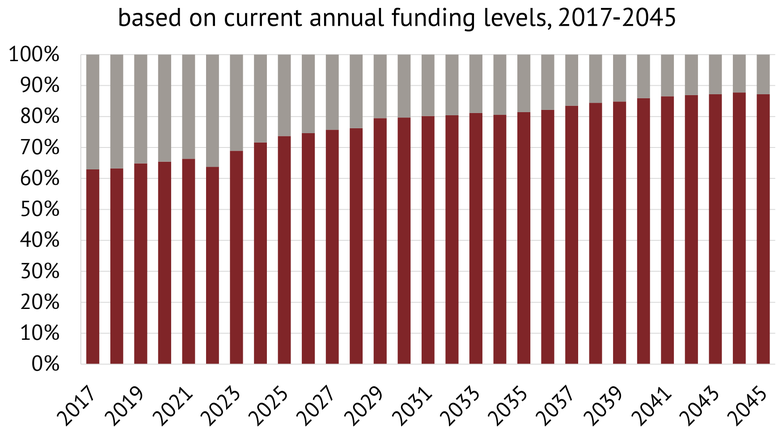
Service needs

Statewide transit ridership, 2005-2045



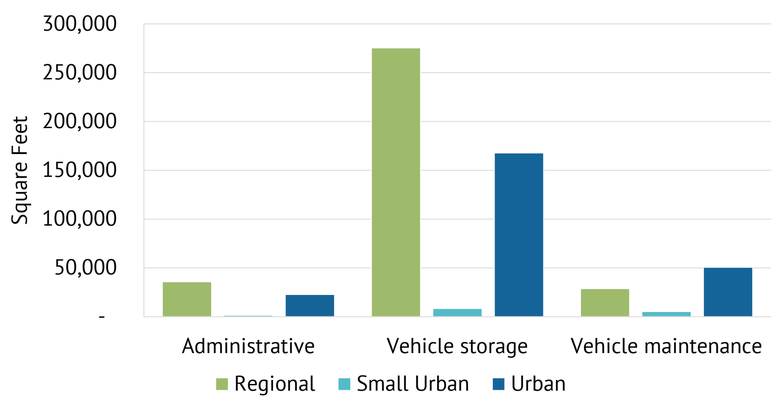
Fleet needs

Percent of statewide fleet that would exceed useful life based on current annual funding levels, 2017-2045



Facility needs

Additional space needed by public transit agencies by 2045



Sources: Iowa Department of Transportation; Iowa's public transit agencies

Rail

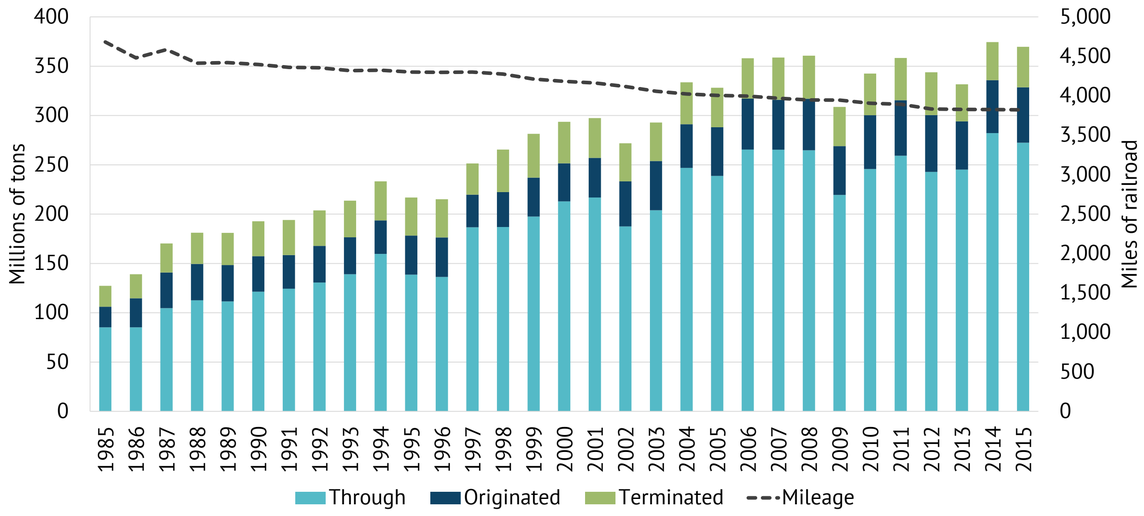
Highlights

- Iowa's railroads serve 90 of 99 counties and nearly half of Iowa's cities.
- In 2015, railroads transported 56.1 million tons originating and 41.1 million tons terminating in Iowa.
- Since 1985, the tons of rail originating, terminating, and traveling through Iowa has more than doubled.
- Farm, food and kindred products, and chemicals accounted for 81 percent of the originated goods in 2015.
- Coal continues to be the largest terminating commodity in Iowa at approximately 23 million tons in 2015.
- Since 2008, crude petroleum by rail through Iowa has increased to more than 2 billion tons.
- In 2015, 4 billion gallons of ethanol were produced in Iowa; 70 percent was shipped by rail.
- Two 100-car trains can carry the load of approximately 870 trucks.
- Each ton-mile of freight moved by rail rather than highway reduces greenhouse gas emissions by two-thirds or more.
- Railroads move a ton of freight an average of 484 miles for each gallon of fuel consumed – close to four times as far as it could be moved by truck.
- More than 57,000 Amtrak passenger rail riders used an Iowa station in 2015.

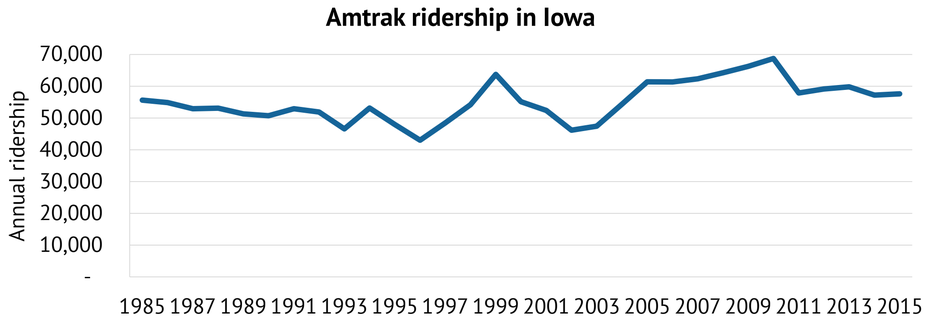
Key issues

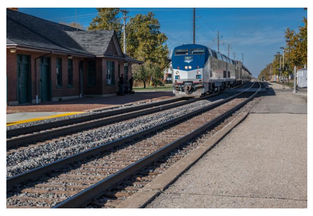
- Additional funding is needed to support necessary capital expenditures.
- The network has steadily decreased in miles, and additional rail capacity is needed to meet future demand.
- Rail improvements will be needed to accommodate heavier rail cars.
- Additional rail spurs are needed to accommodate businesses and industries wanting to locate or expand in Iowa.
- There is a need for enhanced rail access throughout Iowa.
- There are operational, regulatory, and infrastructure bottlenecks to be addressed for the rail system.
- Growing highway and rail traffic is increasing delays and conflicts.
- There are safety concerns related to rail infrastructure and highway-railroad crossings.
- Passenger rail service is limited, with no service to Iowa's larger population centers.
- Energy production and transport is changing.

Rail movements in Iowa and track mileage, 1985-2015



Amtrak ridership in Iowa





Rail needs

Rail needs are derived from the 2017 Iowa State Rail Plan.

Freight rail projects identified include:

- Enhancements to the capacity of the state's rail network.
- Enhancement of existing transload facilities or construction of new transload facilities.
- Enhancement of existing rail access or development of new rail access for shippers/receivers.
- Development of new intermodal facilities.
- Improvements to bridge infrastructure.
- Improvements to track infrastructure.
- Improvements to flood mitigation measures.
- Grade separation of highway/rail grade crossings.
- Improve traffic congestion and enhance safety in urban rail corridors.

Passenger rail projects identified include:

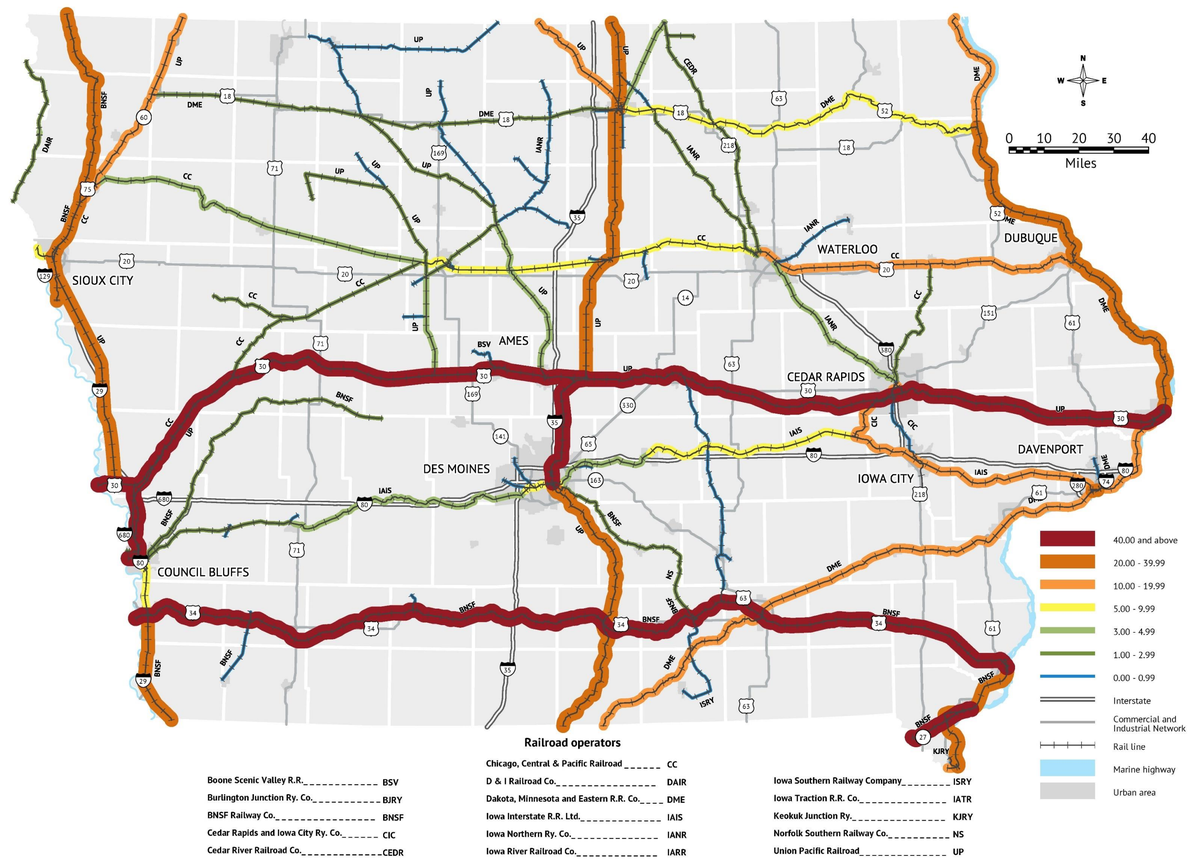
- Implementation of a bus service connecting the Chicago – Quad Cities intercity passenger rail service to Iowa City once the State of Illinois fully implements the Chicago – Quad Cities service.
- Advancement of the proposed phased implementation of intercity passenger rail service in the Chicago-Omaha corridor from Iowa City west to Des Moines and Council Bluffs.
- Improvements to stations and facilities at several existing Amtrak stations in Iowa.
- Implementation of intercity passenger rail service between Council Bluffs-Omaha, Chicago-Dubuque, and Minneapolis/St. Paul-Des Moines-Kansas City.
- Implementation of commuter rail services in the Des Moines and Iowa City-Cedar Rapids areas.

In addition to projects identified in the State Rail Plan, two specific types of issues to be addressed across the rail system include rail bottlenecks and rail lines with weight limitations. These are shown on the map to the right.

Rail bottlenecks can cause delay due to inadequate infrastructure or a lack of capacity.

Weight limitations can prevent tracks from carrying the current industry standard for rail car weight.

Iowa rail lines and density, gross ton-miles per mile



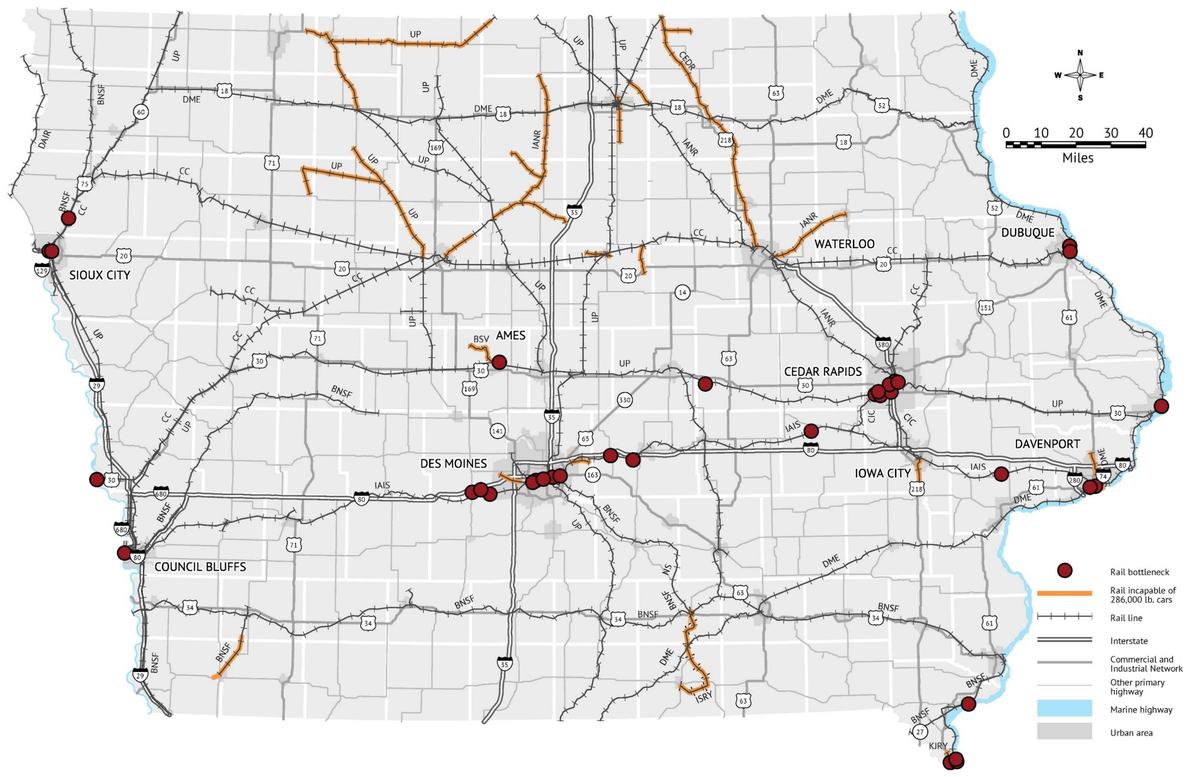
- Freight rail accounts for only 3 percent of Iowa's 130,000-mile freight system, but carries nearly 14 percent of the state's freight tonnage, consisting mostly of bulk commodities.
- Passenger rail service in Iowa is currently provided by two daily Amtrak routes
  - The California Zephyr from Chicago to Oakland, CA (stops in Burlington, Mount Pleasant, Ottumwa, Osceola, Creston)
  - The Southwest Chief from Chicago to Los Angeles, CA (stops in Fort Madison)

Strategies

Iowa DOT strategies for the rail system will include the following. The graphics show which of the four investment areas (stewardship, modification, optimization, and transformation) the strategies relate to.

- Enhance access and connectivity to freight rail service.
- Preserve existing rail service.
- Enhance the safety and security of the rail system through crossing safety, monitoring, and promotional efforts.
- Encourage economic development in Iowa through investment in the rail system.
- Improve the physical infrastructure of the rail system.
- Reduce transportation-related congestion and emissions through investment in and use of the rail system.
- Enhance access and connectivity to passenger rail service.
- Improve the efficiency of the rail system.

Rail bottlenecks and rail lines with weight limitations



Sources: Iowa Department of Transportation; Railroad annual reports; Amtrak

Waterway

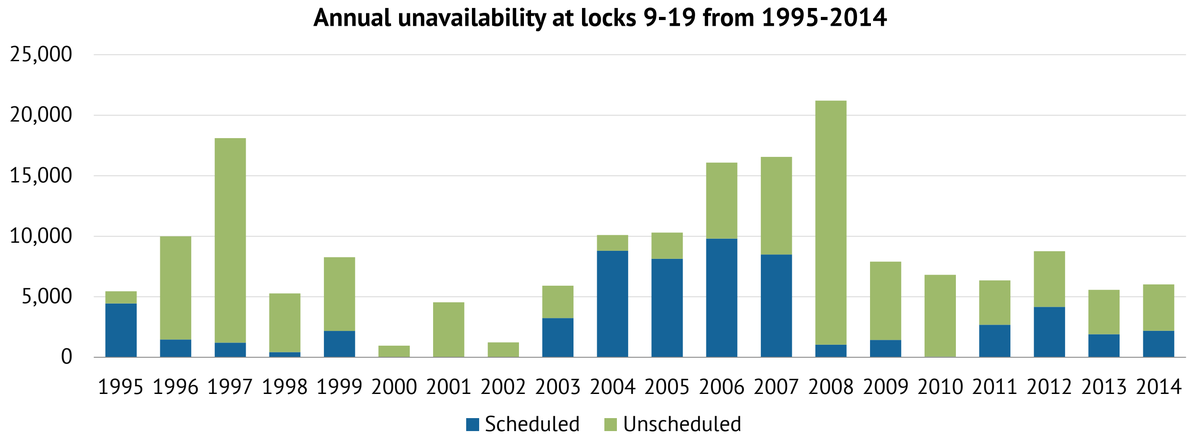
Highlights

- Iowa is the only state in the nation bordered by two navigable rivers, the Mississippi and Missouri.
- Both rivers are part of America's Marine Highway Program. The M-29 Marine Highway Connector runs from Sioux City to Kansas City, Mo.; and the M-35 Marine Highway Corridor runs from St. Paul, MN to Grafton, IL.
- Keokuk is the northern most port on the Mississippi River that is open to barge traffic throughout the winter.
- Located along these rivers are 60 barge terminals (55 on the Mississippi, five on the Missouri) owned and operated by private companies.
- One barge carries the equivalent of 13.4 jumbo train hopper cars or 58 large semitrucks.
- Water transport is more energy efficient than rail and truck movements.

Key issues

- Higher funding levels for river infrastructure are necessary.
- Improving system reliability through infrastructure maintenance is needed.
- Capacity improvements are needed on the Mississippi River.
- Demand for freight movement on the Missouri River is limited.

Annual unavailability at locks 9-19 from 1995-2014



Water needs

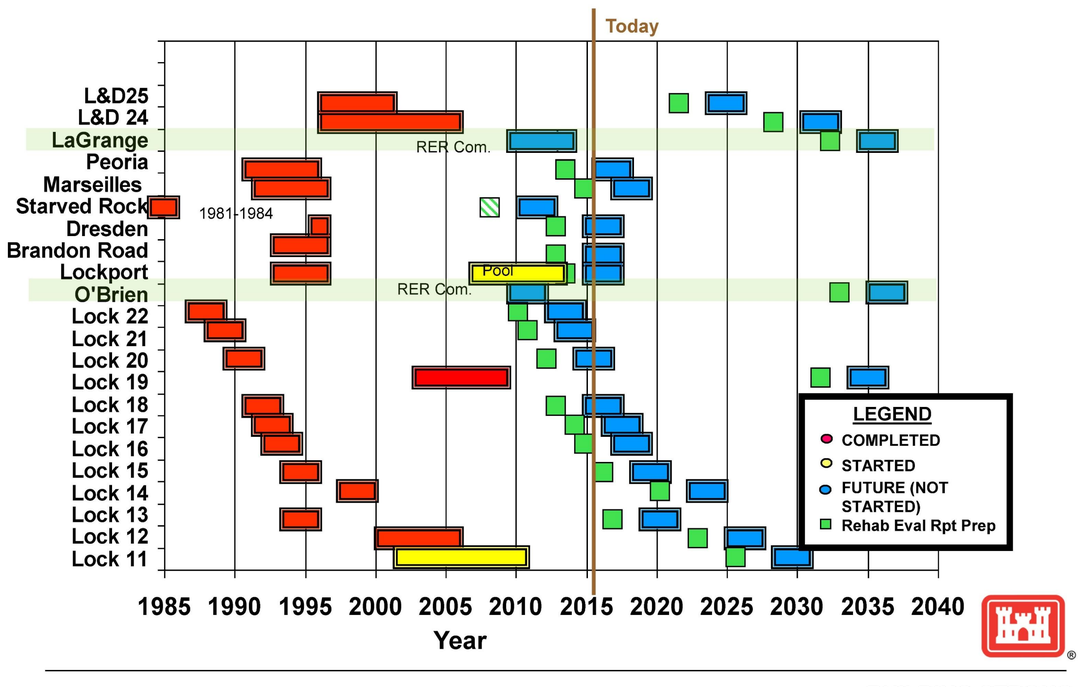
The 2016 Iowa State Freight Plan outlines needed waterway freight improvements, as provided to the Iowa DOT by the U.S. Army Corps of Engineers, which is responsible for all inland waterway navigation projects in the United States. Three types of projects were identified:

Operations and maintenance: Currently only funded at 35 to 40 percent of what is needed each year.

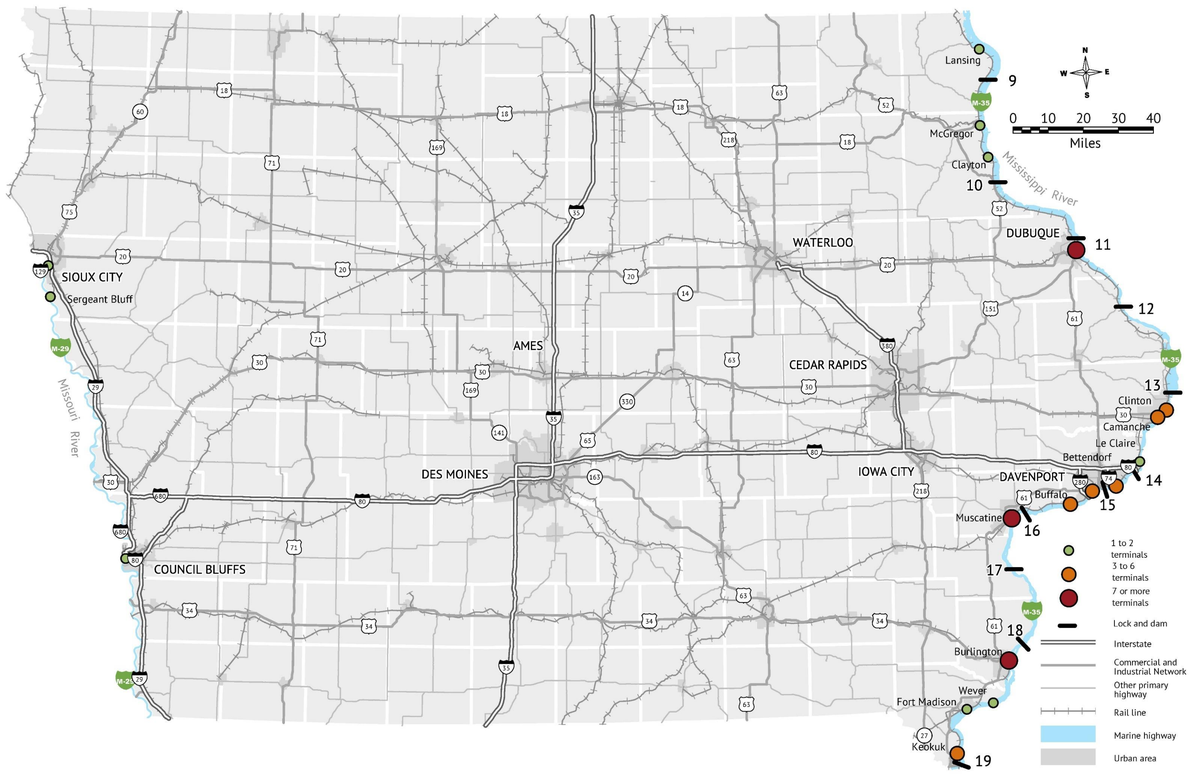
Major rehabilitation: Currently, 14 major rehabilitation projects are behind schedule across the 20 lock and dams that fall within the Rock Island District. Needed funding has not been allocated for the last 15 years.

Improvements (small- and large-scale): Improvements were authorized in 2007, but no construction funds have been appropriated to date. Several small-scale measures, which would improve river traffic efficiency, are ready to construct.

The 14 major rehabilitation projects that are yet to be started on the Mississippi River are shown below. Most of the locks bordering Iowa (locks 11 through 19) are currently in the planning phase, but have not been funded.



Iowa marine highways, locks and dams, and barge facilities

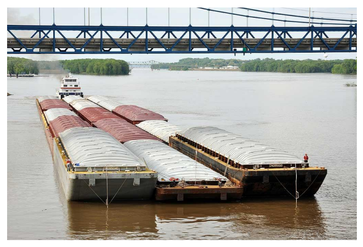


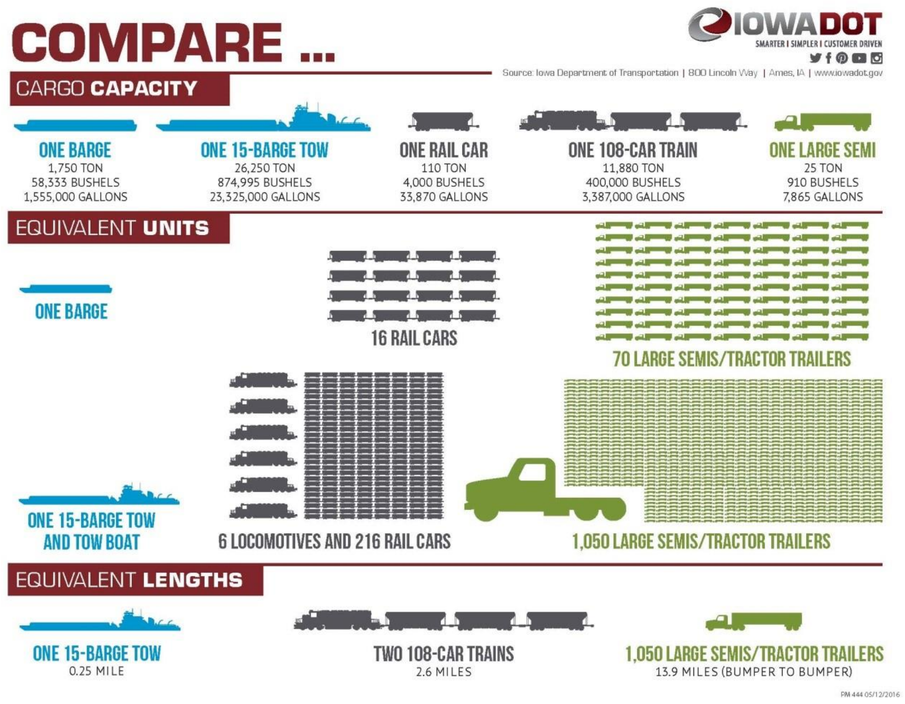
Lock	Location	Chamber	River mile	Year open	Length (feet)	Width (feet)	Owner/ Operator	Gate type
9	Harpers Ferry, IA	Main	647.9	1938	600	110	Corps	Miter
10	Guttenberg, IA	Main	615.1	1936	600	110	Corps	Miter
11	Dubuque, IA	Main	583	1937	600	110	Corps	Miter
12	Bellevue, IA	Main	556.7	1939	600	110	Corps	Miter
13	Clinton, IA	Main	522.5	1938	600	110	Corps	Miter
14	Le Claire, IA	Main	493	1922	600	110	Corps	Miter
14	Le Claire, IA	Aux 1	493	1939	320	80	Corps	Miter
15	Rock Island, IL	Main	482.9	1934	600	110	Corps	Miter
15	Rock Island, IL	Aux 1	482.9	1934	360	110	Corps	Miter
16	Muscatine, IA	Main	457.2	1937	600	110	Corps	Miter
17	New Boston, IL	Main	437.1	1939	600	110	Corps	Miter
18	Gladstone, IL	Main	410.5	1937	600	110	Corps	Miter
19	Keokuk, IA	Main	364.3	1957	1,200	110	Corps	Vertical

Iowa's waterway system plays a key role in moving grain and bulk commodities to and from Iowa. While the Iowa DOT has not directly invested in this system, the department does have an advisory role with representation on the Upper Mississippi River Basin Association and the State Interagency Missouri River Authority.

A system of locks and dams on the upper Mississippi River, operated by the U.S. Army Corps of Engineers, helps to maintain adequate water levels for barge operations. Many of these facilities date to the 1930s.

Water transport fills an important role in freight movement as it has the ability to carry the most weight while offering the lowest shipping cost per ton of commodity. Although they rely on truck and rail to deliver goods, private barge terminals on the Mississippi and Missouri rivers are a key part of grain and commodity movement for products moving into and out of Iowa.





Strategies

Iowa DOT strategies for the waterway system will include the following. The graphics show which of the four investment areas (stewardship, modification, optimization, and transformation) the strategies relate to.

ST MO TR OP Continue to advance efforts on the M-35 Marine Highway Corridor.

ST MO TR OP Promote freight movement on the M-29 Marine Highway Connector.

Sources: Iowa Department of Transportation; U.S. Army Corps of Engineers

Highway

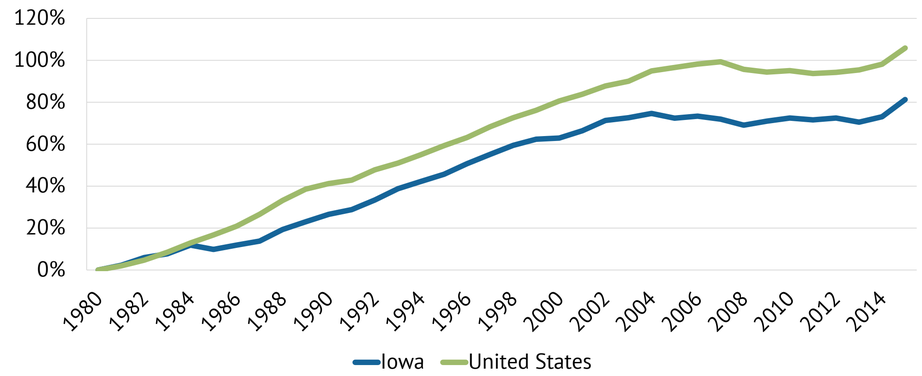
Highlights

- Iowa has 114,880 miles of roadways.
- There are 9,403 miles in Iowa's Primary Highway System.
- There are 2,521 miles in Iowa's Commercial & Industrial Network (CIN).
- Two transcontinental interstate highways cross Iowa.
- Iowa has more than 24,000 bridge structures.
- Nearly 20,000 trucking companies operating in Iowa
- Motor vehicles travel more than 30 billion miles on Iowa's public roads each year.
- Iowa's road system facilitates the movement of over 1.1 billion tons of freight annually.
- The weighted average daily traffic on the Interstate Highway System in municipal areas is more than double that in rural areas.
- Approximately 216,300 acres of roadside right of way that is maintained by the state.
- Iowa DOT maintenance crews plow approximately 24,500 lane-miles with each winter storm event, nearly equivalent to one trip around the earth.

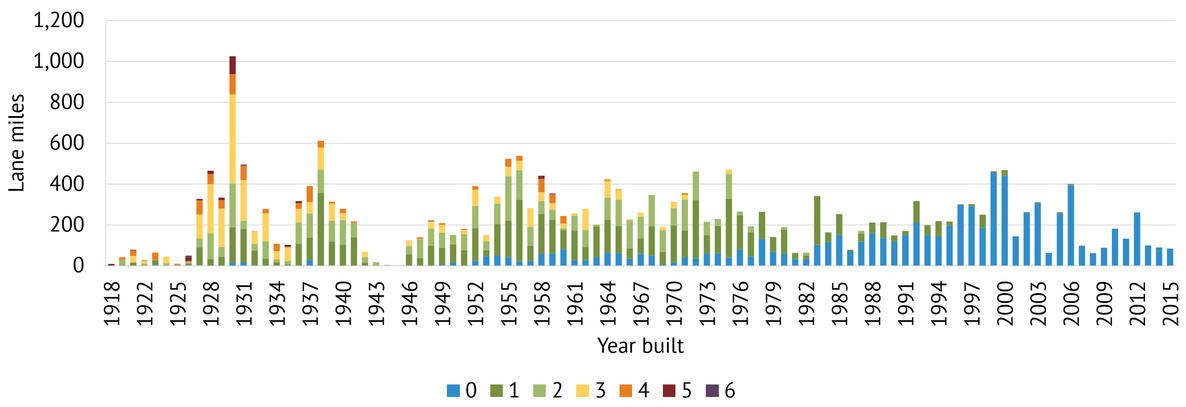
Key issues

- Many high-cost bridge structures have major deficiencies.
- Urban and commuter route congestion is growing.
- Rural and urban interstate congestion is becoming more prevalent.
- Safety needs exist on the system.
- Additional on-road accommodations are needed for bicycle and pedestrian trips.
- Sustainable funding is needed to maintain acceptable condition ratings for roadways and bridge structures.

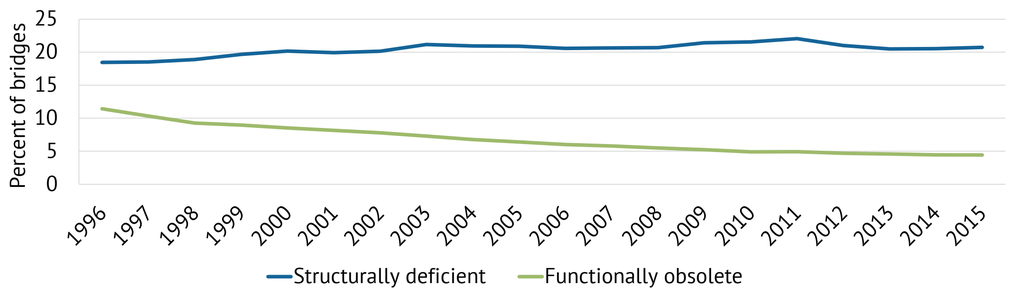
Percent change in traffic, base year 1980



Year built and number of overlays for primary system pavements



Percent of bridge structures in Iowa considered structurally deficient or functionally obsolete, 1996-2015



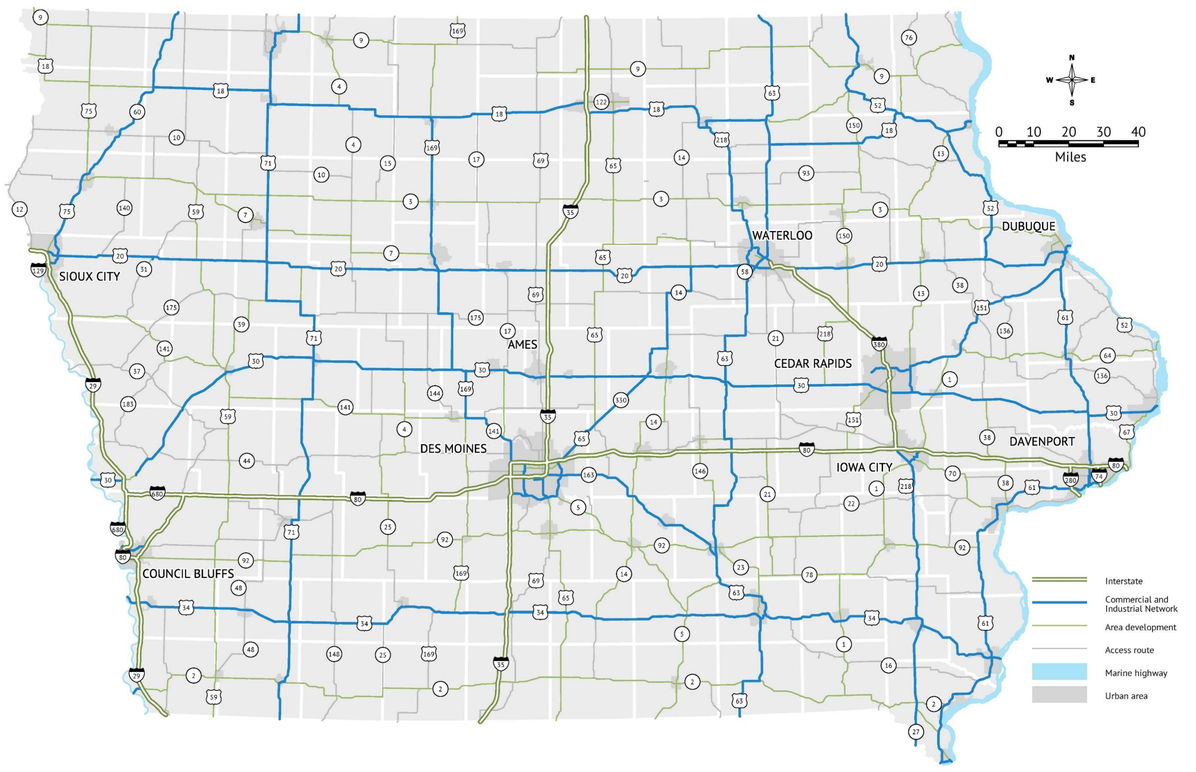
Highway needs

Several layers of analysis (shown to the right) were conducted as part of the highway improvement needs analysis for the Plan. Each layer involved using various Iowa DOT plans and tools to analyze different types of needs from a system-wide perspective. Most layers identified needs at the corridor level, with only freight and bridge improvement needs being identified for specific locations.

While specific locations have been identified for each layer of analysis, this process does not define the types of treatments to be implemented or identify specific projects or alternatives. It also does not mean that needs identified here will subsequently become funded projects, as additional factors help determine when and how a project proceeds. However, this analysis does help provide a corridor level perspective that will be an important consideration as individual projects are developed, and will help ensure identified needs are taken into account during the project scoping process.

The various layers of analysis are discussed on separate boards.

Iowa's primary highways by classification



Iowa's Primary Highway System, which is under Iowa DOT jurisdiction, totals just over 9,400 miles of the public roadway system's over 114,000 miles, is divided into five classifications according to priority.

1. Interstate: Provides connections to the national transportation network and major metropolitan areas (1,061 miles)

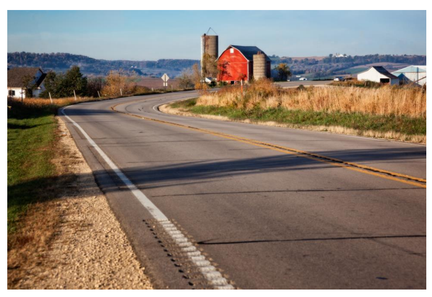
2. Commercial and Industrial Network (CIN): Provides connections for Iowa cities with a population greater than 20,000 to major metropolitan areas, and was identified by the state legislature to enhance opportunities for the development and diversification of the state's economy (2,521 miles)

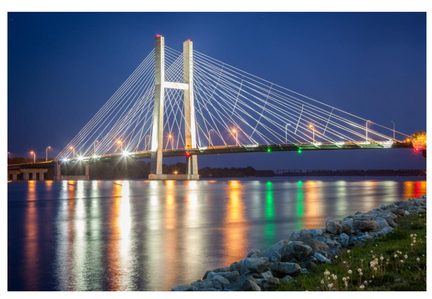
Other primary highways comprise the remaining 5,821 miles, and include the following routes.

3. Area development: Provide connections for cities with populations greater than 5,000 to the CIN and major commercial and industrial centers.

4. Access route: Provide connections for cities with populations greater than 1,000 to employment, shopping, health care, and education facilities.

5. Local service: Provide connections for cities with populations less than 1,000 to local commercial and public service.





Strategies

Iowa DOT strategies for the highway system will include the following. The graphics show which of the four investment areas (stewardship, modification, optimization, and transformation) the strategies relate to.

- Target investment to address capacity needs at locations with forecast congestion issues.
- Secure additional funding and develop more refined management systems to address the approaching wave of bridge replacement needs.
- Right size the highway system and apply cost-effective solutions to locations with existing and anticipated issues.
- Target investment to address mobility and safety needs on critical two-lane routes.
- Target investment to address bridges with condition needs.
- Target investment to address condition needs at locations with measured structural and service issues.
- Prioritize active operations management of the interstate highways, followed by primary municipal highways, primary rural highways, and border bridges.
- Target investment to address freight needs at locations with measured mobility issues.
- Consider creative financing as part of coordinated planning and programming efforts to address future large bridge projects.
- Consider targeted anticipatory investments at locations with potential congestion issues beyond the planning horizon.

Sources: Iowa Department of Transportation; U.S. Department of Transportation

Highway Needs

Capacity analysis

Capacity needs at the statewide level were evaluated based on current conditions and anticipated future traffic. For both timeframes, a volume-to-capacity (V/C) ratio was used, which estimates how much capacity remains on a roadway based on how much traffic it carries and how much traffic it could carry. It is estimated that a facility is congesting as V/C approaches a value of 1.0. Values above 0.7 were considered to be approaching capacity, and values greater than 1.0 were considered over capacity. The V/C ratios were evaluated at a corridor level, meaning spot locations (generally less than 0.5 mile) were not specifically identified.

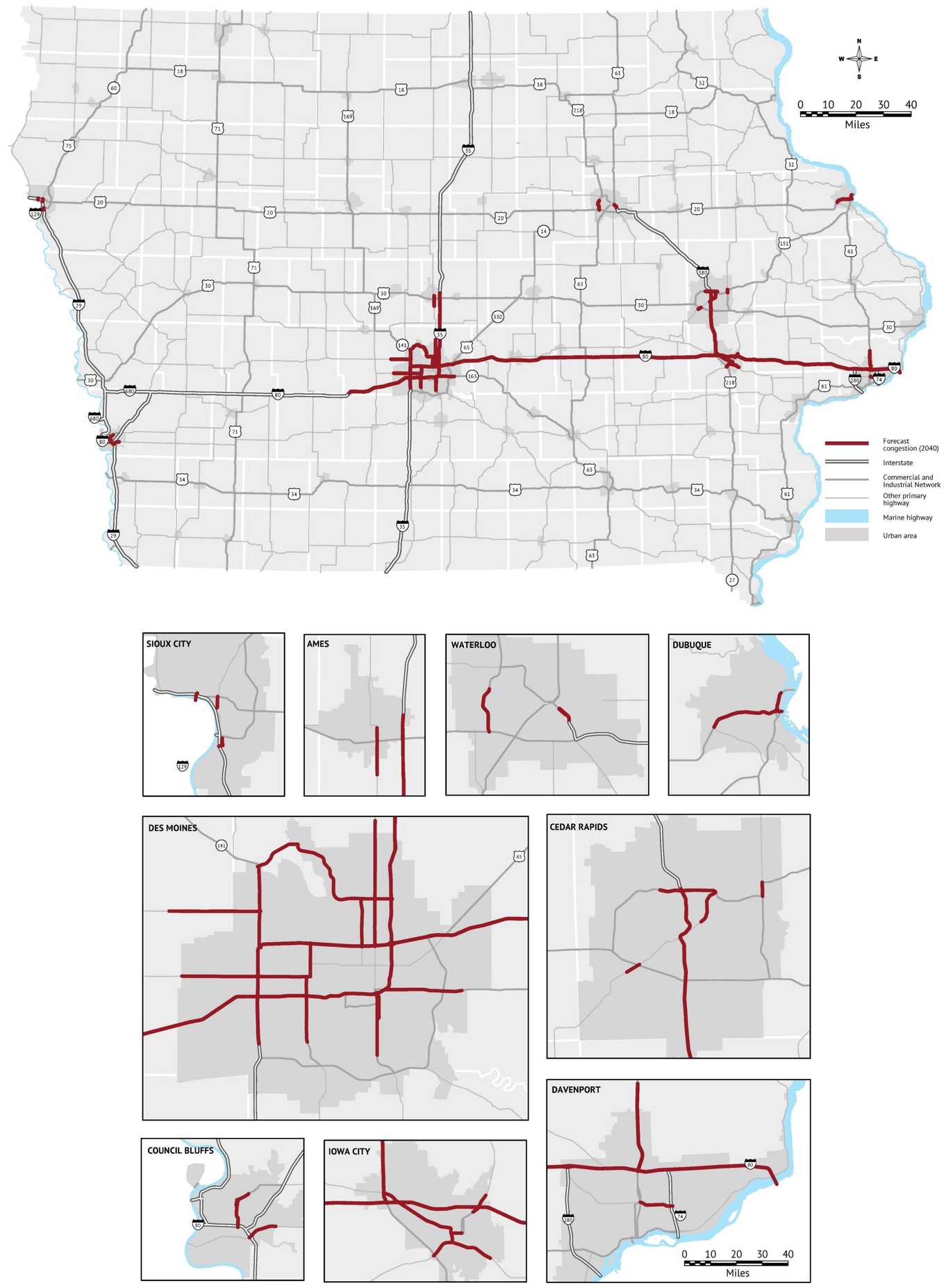
- Current V/C conditions were derived from the Infrastructure Condition Evaluation (ICE) tool, which includes a congestion index.
- Future V/C conditions were forecast with the Iowa Travel Analysis Model (iTRAM), which is a statewide travel demand model that estimates travel activity. The analysis simulated what traffic would be like in 2040 if no additional roadway improvements were made beyond those currently funded.
    - In urban areas, future V/C conditions utilized individual travel demand models from each of Iowa's metropolitan planning organizations (MPOs).

The analysis for future conditions shows that the majority of congestion is forecast to exist in the following areas, and will worsen from current conditions.

- Urban areas, including Des Moines, Iowa City, Cedar Rapids, and Davenport, with more isolated congestion occurring in some of the state's other urban areas.
- I-80 from west of Des Moines to the Mississippi River, with the worst congestion from Iowa City to Davenport.
- I-35 from Des Moines to Ames.
- I-380 from Iowa City to Cedar Rapids.

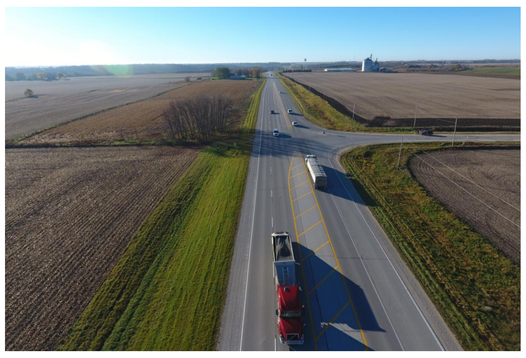
Overall, the results from both analyses were consistent in showing there is limited congestion on Iowa's primary network as a whole. This is anticipated to remain the case in the future, with corridor-level congestion being confined to urban areas and the three interstate corridors identified above.

Statewide and urban corridors forecast to be approaching or over capacity in 2040



I-80 near Iowa City. Much of I-80 from Dallas County to the Mississippi River is forecast to experience congestion by 2040.

US 169 between Fort Dodge and Humboldt, which has mobility and safety improvements such as passing and turning lanes.



Mobility and safety analysis

The objective of this layer of analysis was to provide a data-driven recommendation for mobility and safety improvements to Primary Highway System corridors. These improvements would enhance the operation of the network in particular corridors where capacity expansion needs were not identified, and would serve as a complimentary network to the state's multilane highway network.

The statewide and urban capacity analysis showed a lack of current and future capacity needs on the majority of the Primary Highway System outside of urban areas and certain interstate highways. However, providing enhanced corridors along the state's two-lane highway system would improve statewide mobility and complement the existing and committed multilane network.

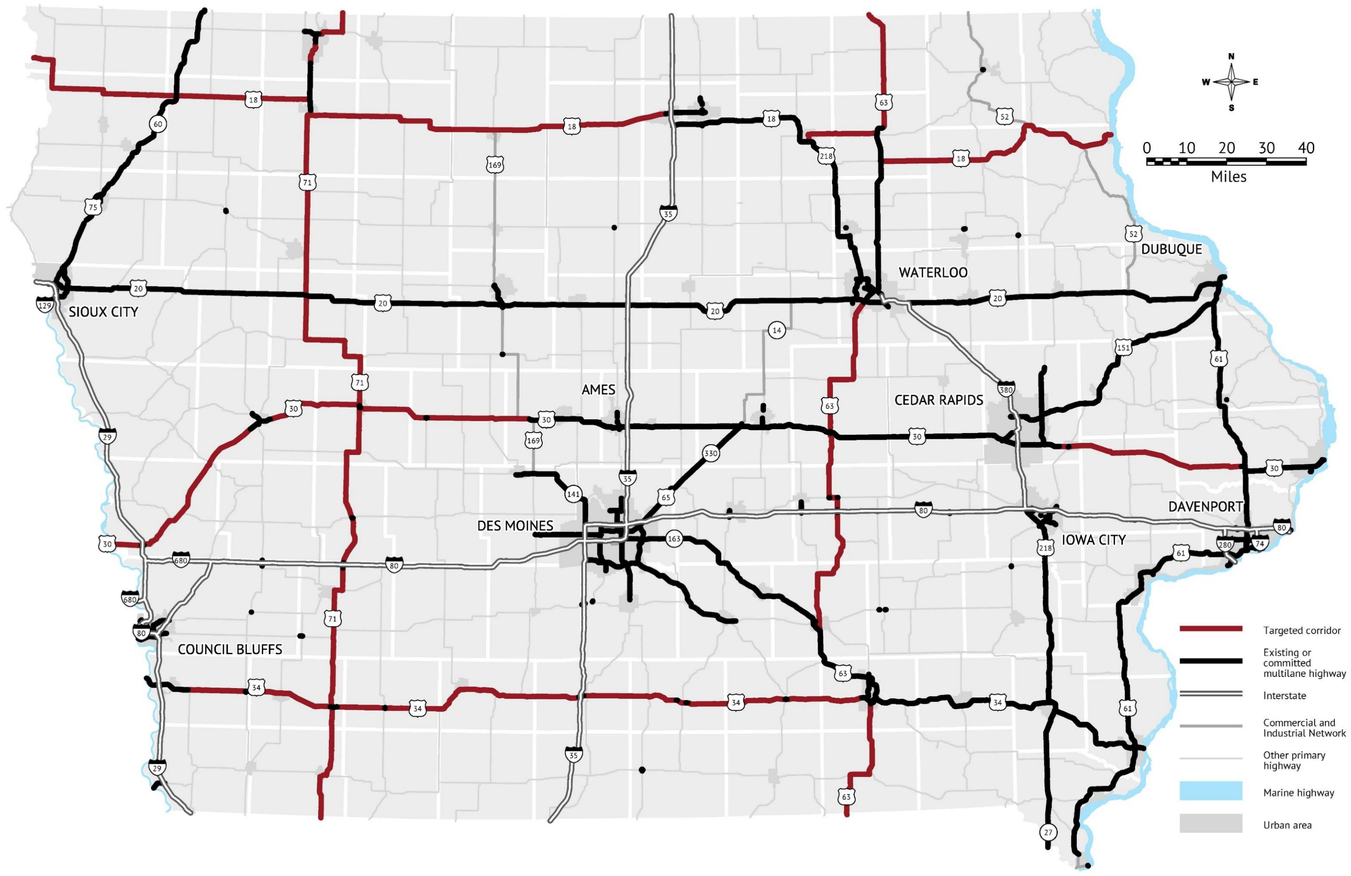
As part of the 1997 Iowa in Motion State Transportation Plan, the Iowa DOT introduced the idea of Super-2 style roadways with the basic goals of maximizing the benefits of two-lane roadways through improved roadway safety, capacity, and mobility, while reinforcing the growing importance of lowering construction and maintenance costs. Super-2 improvements serve as alternatives to four-lane capacity expansion projects and can aid in uninterrupted flow of traffic and the accommodation for slower traffic when necessary. The improvements targeted through this analysis would be a more relaxed application of the Super-2 design, with the appropriate mix of elements being implemented on a corridor when work is being done for safety or condition improvements.

Specific examples of these design elements include:
- Wider paved shoulders
- Limited access
- Geometric improvements
- Left- and right-turn lanes
- Acceleration lanes
- Climbing/passing lanes

In order to analyze needs across the network and help target corridors for improvement, attributes related to existing climbing/passing lanes, crashes, grade, traffic and percent truck traffic, and average trip length were evaluated. The data was then filtered with an emphasis on statewide connectivity, geographic access, and existing network designations. This led to a proposed network to target for corridor-level mobility and safety improvements, which includes US 18, 30, 34, 63, and 71.

An analysis of two corridors where Super-2 style improvements were constructed during 2008-2011 showed significant safety benefits. The analysis reviewed crashes in the several years prior to construction and after construction. The analysis showed a 26 percent reduction in total crashes, which increases to a 67 percent reduction if animal crashes are excluded on US 169 from Fort Dodge to Humboldt, and a 49 percent reduction in total crashes on US 63 from Oskaloosa to New Sharon.

Corridors targeted for mobility and safety improvements



Highway Needs

Freight analysis

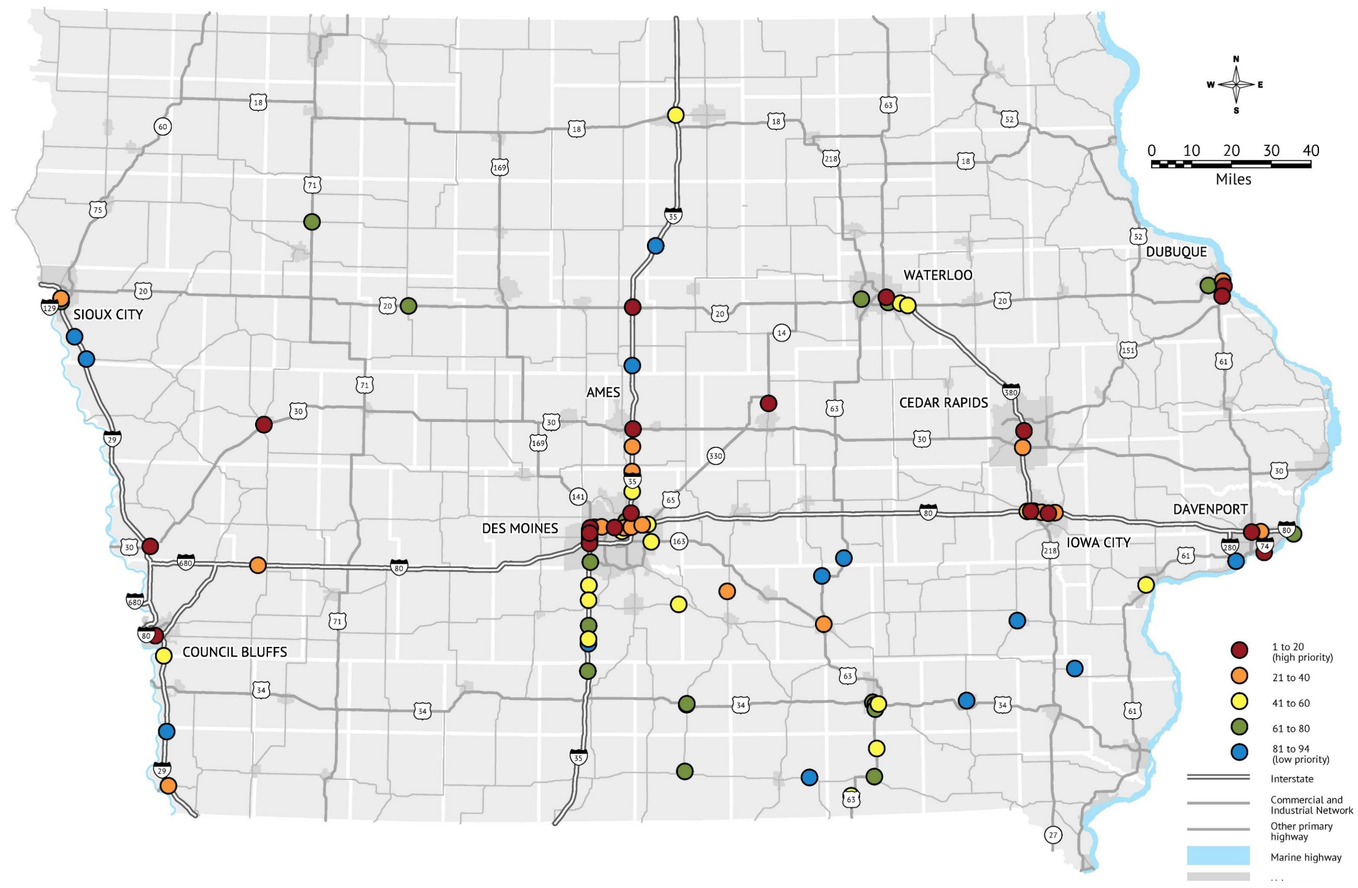
The Iowa DOT's State Freight Plan was finalized in 2016. The planning effort involved an analysis called VCAP, which stands for value, condition, and performance, to evaluate and prioritize freight bottlenecks on the Primary Highway System. The results represent locations on the highway system where freight movement may be hindered and improvements to facilitate more efficient freight flow should be considered.

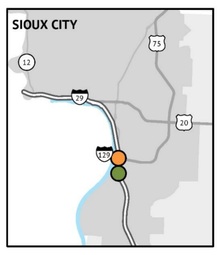
The VCAP analysis takes advantage of multiple tools available at the Iowa DOT and includes the following steps.

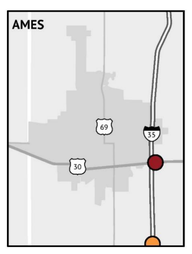
- A **Freight Mobility Issues Survey** populated the initial list of locations based on INRIX traffic data and input from the Freight Advisory Council, Iowa DOT districts, and planning agencies. The traffic data allowed the identification of highway segments that had recurring slowed speeds throughout the year and significant truck volumes. The input from stakeholders helped expand this list to include other locations of concern.
- The **statewide travel demand model, iTRAM**, was used to provide a measure of value for each location based on how much it improves the efficiency of the statewide network. This value was provided by comparing how truck traffic typically moves on the roadway network to how truck traffic moves on the roadway network if each particular location cannot be used, and traffic has to reroute. A larger decrease in efficiency means a higher value for the location.
- The **Infrastructure Condition Evaluation (ICE) tool** provided the condition measurement for each location based on ICE's composite rating of seven condition and traffic criteria. The ICE composite rating was based on a weighted average of the highway segments making up each location, with a poorer condition score meaning a higher ranking for the location.
- The **INRIX bottleneck ranking tool** provided the performance component of each location based on how often bottlenecks occur. Bottlenecks are flagged based on speeds being below a particular threshold for more than five minutes, with a higher number of bottlenecks meaning a higher ranking for the location.

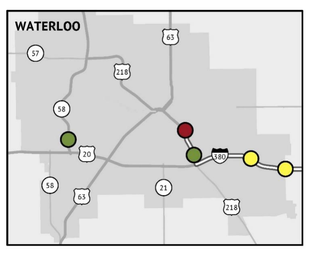
For each VCAP category, all candidate locations were ordered and ranked based on their values for that attribute. Then, the average of these three rankings was calculated and the candidate locations were assigned an overall priority rank. If two locations had the same average ranking, the annual average daily truck traffic (AADTT) at the locations was used as a tiebreaker.

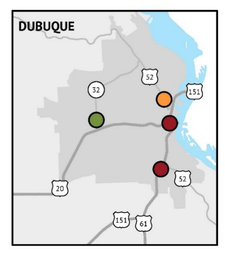
Freight bottleneck locations on the Primary Highway System

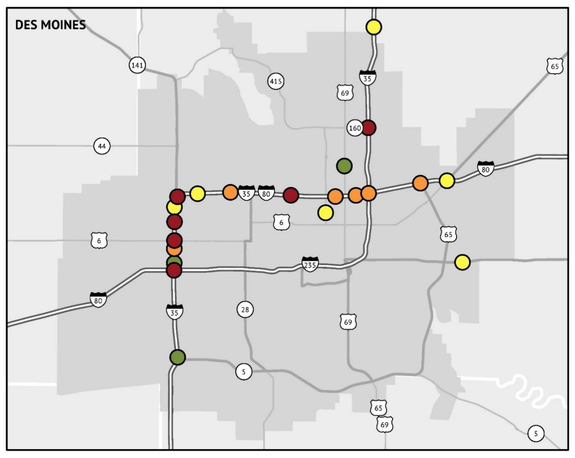


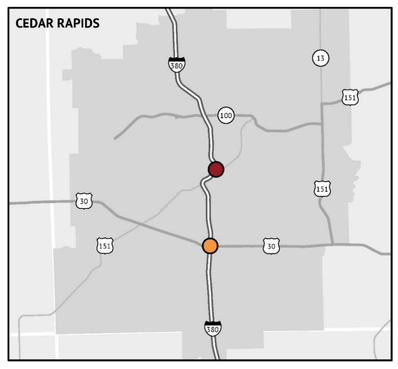


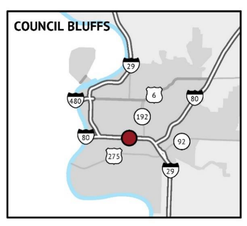


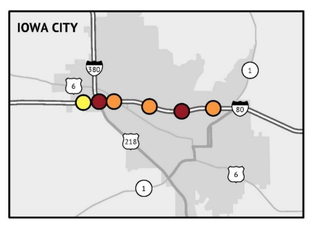


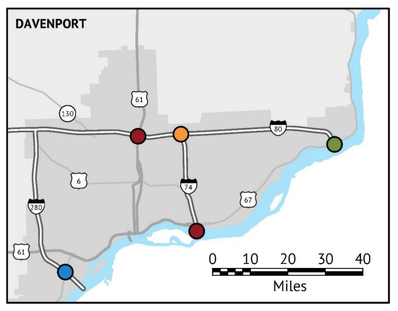












The I-80, I-380, US 218 interchange, which has been identified as a freight bottleneck and will be undergoing reconstruction.

Monitoring the highway system and responding to incidents are crucial operations strategies, particularly on interstates.

Operations analysis

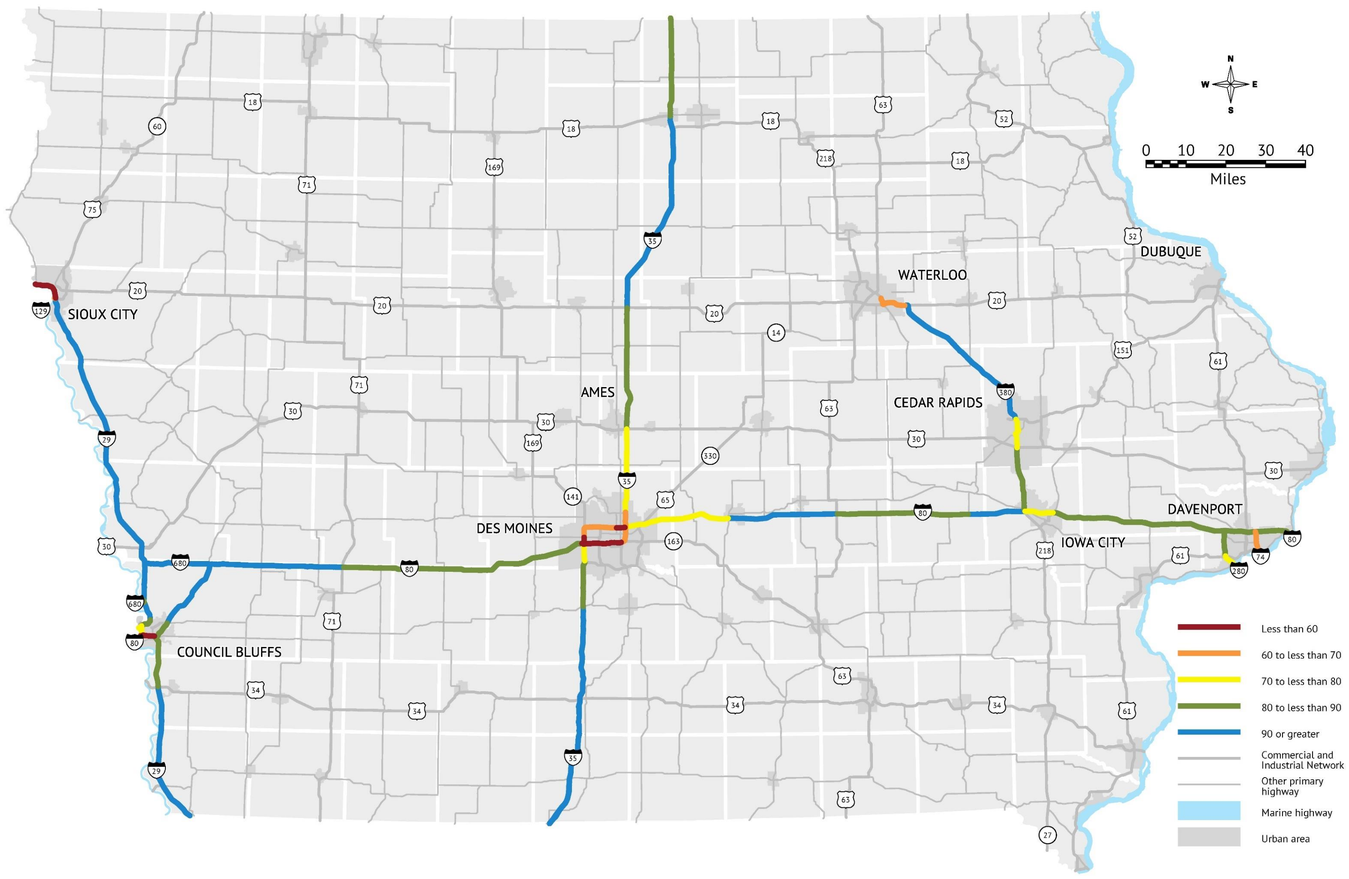
The operations analysis for the highway system included separate approaches for interstates and non-interstates. The ICE-OPS tool was used to evaluate and rank 54 interstate corridors from an operations perspective. Much of the data used in ICE-OPS is only reliable for the interstate system, and becomes less reliable or non-existent for much of the remainder of the primary system. Thus, operations for the non-interstate primary system are addressed at a programmatic level rather than corridor level, and the action plan identifies several system-level transportation systems management and operations (TSMO) strategies derived from the TSMO plan.

The ICE-OPS tool has a similar structure as the original ICE tool, but with an operations focus. It uses the following nine operations-oriented criteria to rank highway segments.

- All bottleneck occurrences per mile
- Freight bottleneck occurrences per mile
- Traffic incident frequency per mile
- Crash rate
- Reliability index
- Event center buffer index
- Weather-sensitive corridor mileage
- AADT
- ICE rating

Each element is assigned a normalized value (1-10 scale) based on range of observed values, and a composite score is calculated after applying weighting to each normalized value. Overall, corridors ranking as higher priorities (lower scores) through this analysis are generally in metropolitan areas. The analysis helps identify corridors where strategies related to improving the operation of the system may be most beneficial.

ICE-OPS composite ratings for the interstate system



Highway Needs

Condition analysis

The primary basis for the condition analysis was the Infrastructure Condition Evaluation (ICE) tool, which was developed to aid in the evaluation of the state's Primary Highway System by using a composite rating calculated from seven different criteria. The tool offers the ability to evaluate the overall structural and service condition of roadway segments with this single composite rating. The following criteria are used in the composite rating.

- Pavement Condition Index (PCI) rating
- International Roughness Index (IRI) value
- Structure Inventory and Appraisal (SIA) sufficiency rating
- AADT, combination truck count
- AADT, single-unit truck count
- AADT, passenger count
- Congestion Index value

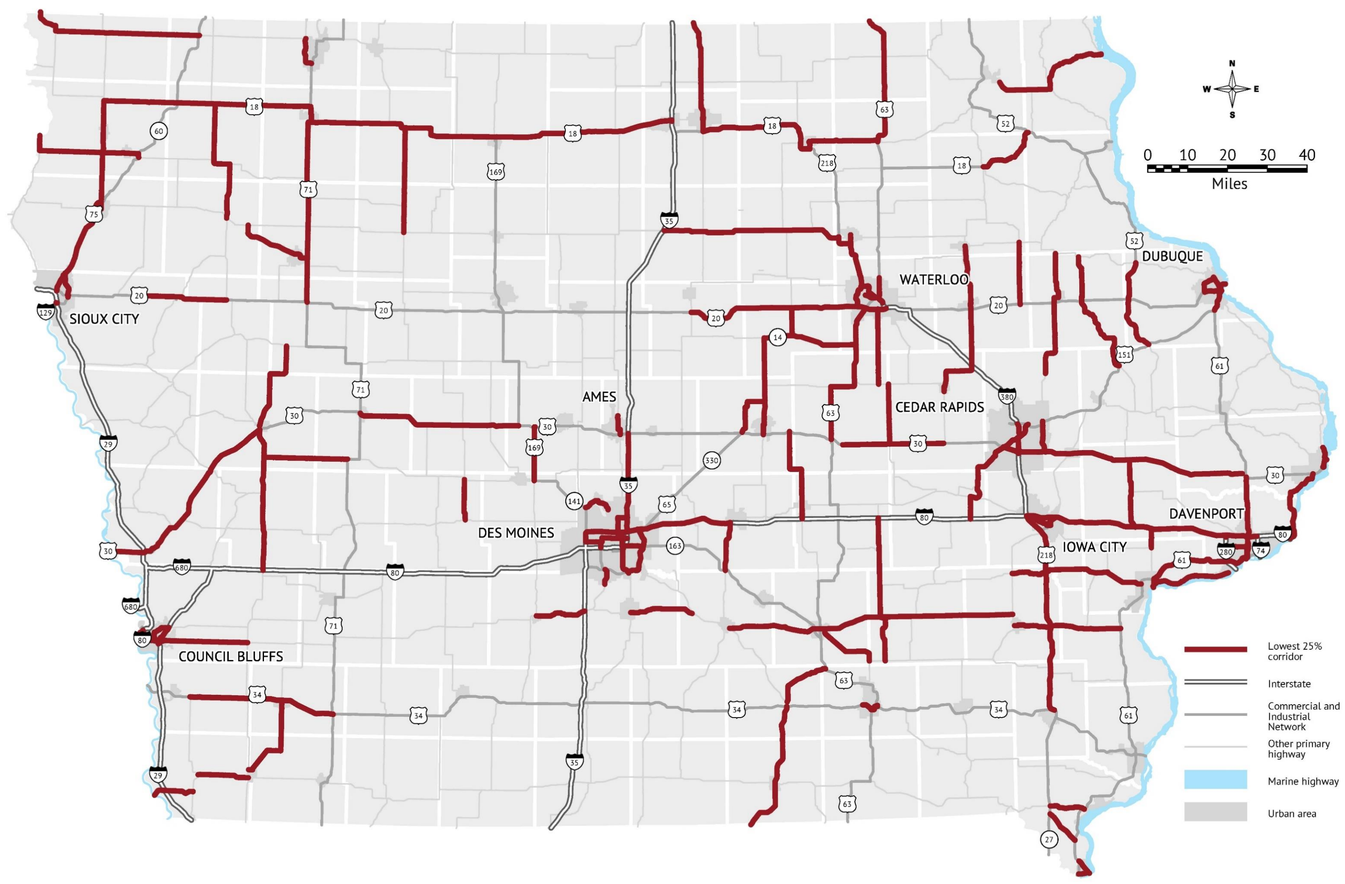
The primary system is comprised of a total of 27,141 segments that were analyzed. For each segment, the value for each criterion was normalized. Then the seven normalized values were weighted by a formula and added together to determine a composite rating for the segment.

To make analysis more manageable, the thousands of segments were aggregated into 464 analysis corridors, with termini based on major road crossings, geographic features, and incorporated boundaries. Each corridor was assigned a composite ICE rating based on a weighted average of the composite ratings for the individual segments within it.

To identify a subset of corridors to represent condition improvement candidates in this Plan, the 464 corridors were sorted based on their overall composite rating. Corridors making up the lowest-rated 25 percent of the system by mileage were selected. This threshold was based on an assumed pavement design life of 20-40 years, depending on the surface material. Using 20 years as a conservative basis means approximately 5 percent of the system's surface would need to be improved in some fashion each year to keep up with deterioration. Since this Plan is updated every five years, applying this annual 5 percent figure to the five-year life of the Plan results in the 25 percent calculation.

Since condition information is aggregated, there may be corridors identified in the bottom 25 percent of the system that have segments in good condition within them, and vice versa. Identification of these corridors also does not mean they will automatically be targeted for improvement, as asset management strategies and other elements factor into when projects proceed.

Bottom 25 percent of primary highway corridors based on ICE composite rating



Example highway that may be targeted for condition improvements.

The I-74 bridge over the Mississippi River, which will involve a multi-year reconstruction project.

Bridge analysis

Bridge needs were approached in multiple ways. There are several major bridge projects that have been identified by the Iowa DOT as needing to occur over the next couple of decades. These projects, most of which are border river crossings, can be very expensive projects that require significant resources and coordination among states. These projects include the following.

- I-74 over the Mississippi River – replacement
- I-80 over the Mississippi River – replacement
- IA 9 over the Mississippi River – replacement
- US 67 over the Mississippi River – replacement
- I-280 over the Mississippi River – deck replacement
- I-129 over the Missouri River – deck overlay
- IA 12 Gordon Drive viaduct, Sioux City – replacement
- IA 175 over the Missouri River – replacement
- US 20 over the Mississippi River – replacement
- US 30 over the Mississippi River – replacement
- US 63 Ottumwa viaduct, Ottumwa – replacement

In addition to awareness of these significant bridge needs, a condition analysis was conducted for bridges, similar to the condition analysis completed for highway corridors. For this analysis, the bridge condition index for the 4,355 structures on the primary system was reviewed, and bridges making up the lowest-rated 5 percent of the system's bridges were selected. This threshold was based on an assumed bridge design life of 100 years, which would mean that approximately 1 percent of the system's bridges would need to be improved in some fashion each year to keep up with deterioration. Since this Plan is updated every five years, applying this annual 1 percent figure to the five-year life of the Plan results in the 5 percent calculation.

Within this set of lowest-ranking bridges, those that are estimated to cost more than $5 million to replace are also highlighted. Multiple projects of this magnitude can quickly use up the funding available for bridge replacements in a given year. Identification of these bridges does not mean they will automatically be targeted for improvement, as asset management strategies and other elements factor into when projects proceed.

Major bridge needs and bottom five percent of primary highway bridges by condition